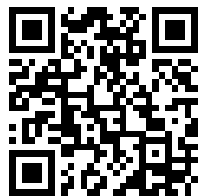


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NORTH SEA PILOT

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PART III.  
FIFTH EDITION.  
1889



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# NORTH SEA PILOT.

## PART III.

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### EAST COAST OF ENGLAND.

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BEING THE RESULT OF VARIOUS SURVEYS MADE BY ORDER OF THE  
LORDS COMMISSIONERS OF THE ADMIRALTY, TO 1888.

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*FIFTH EDITION.*

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PUBLISHED BY ORDER OF THE LORDS COMMISSIONERS OF THE ADMIRALTY.

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# ADVERTISEMENT

TO  
THE FIFTH EDITION.

THE North Sea Pilot, Part III., contains Sailing Directions for the East Coast of England from Berwick to the North Foreland, including the Estuary of, and the River Thames.

Materials for the directions from the North Foreland to the Nore were furnished by Commander E. Burstal, R.N., who was for many years employed in the survey of the River Thames and its approaches; these have been corrected, where necessary, from the recent surveys of H.M.S. *Triton*.

The work was originally prepared in 1857 by Staff Commander E. K. Calver, R.N., who had been employed on the survey of this coast from the year 1836. The second edition was published in 1869.

The third edition was revised and corrected by Mr. E. C. Davison, R.N., in 1874. The fourth edition was prepared by that Officer in 1882.

The present edition has been revised by Staff-Captain T. H. Tizard, R.N., H.M.S. *Triton*, from the latest Admiralty surveys, from personal observations and from information furnished by the several local authorities. In this edition the directions for the River Thames, from the Nore to London bridge; also for the River Medway hitherto contained in North Sea Pilot, Part 4, have been embodied.

Seamen are invited to transmit to the Secretary of the Admiralty notices of any errors or omissions they may detect in this work.

By the publication of this work all Hydrographic Notices relating to former editions, also all Notices to Mariners, including No. 161 of 1889, are cancelled.

W. J. L. W.,

Hydrographic Office, Admiralty, London.

May 1889.



By transfer  
JUL 16 1918.

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**IN THIS WORK THE BEARINGS ARE ALL MAGNETIC  
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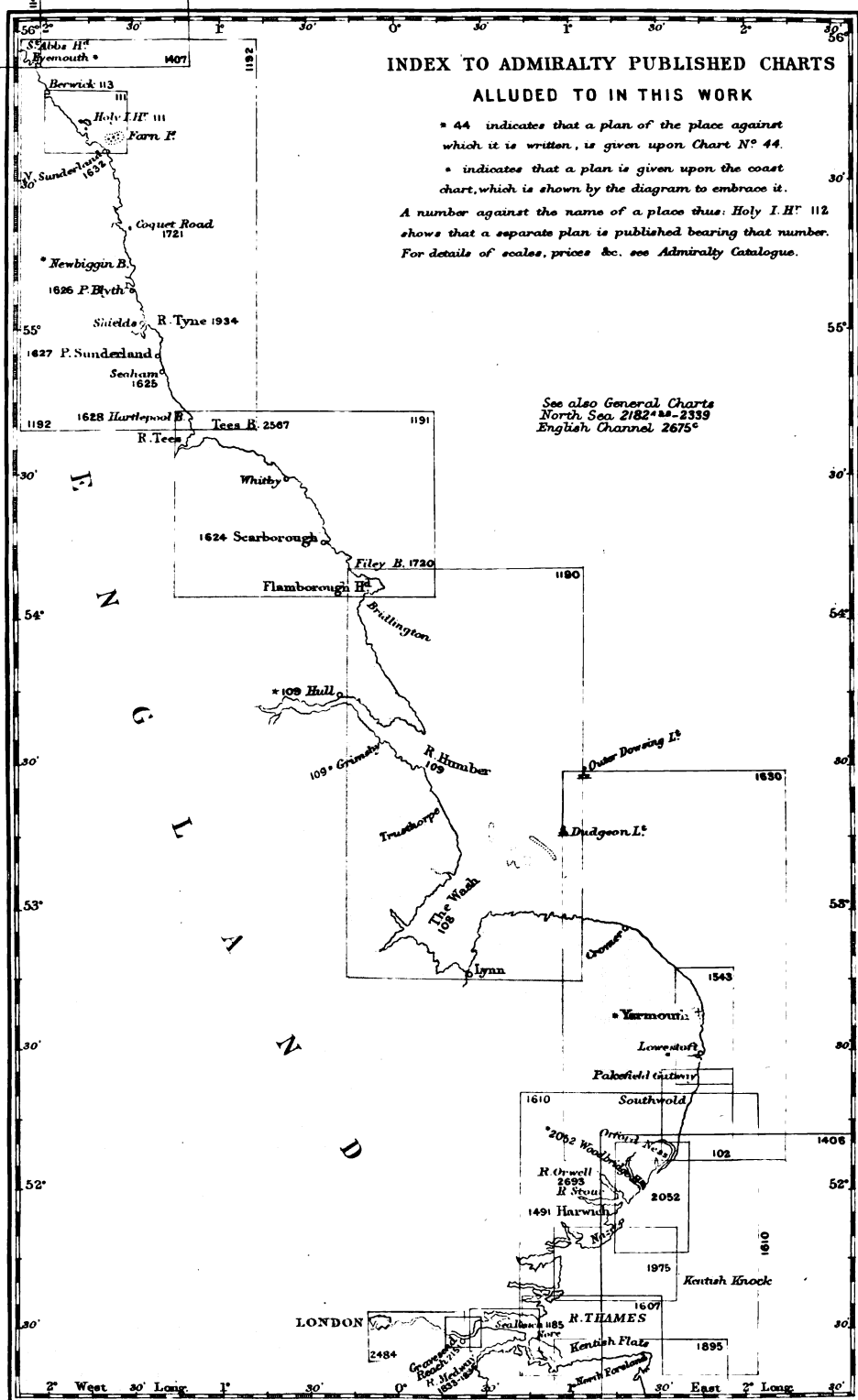
**THE DISTANCES ARE EXPRESSED IN SEA MILES OF  
60 TO A DEGREE OF LATITUDE.**

**A CABLE'S LENGTH IS ASSUMED TO BE EQUAL TO  
100 FATHOMS.**

**THE SOUNDINGS ARE REDUCED TO LOW WATER OF  
ORDINARY SPRING TIDES.**







For later information respecting the lights which are described in this work, seamen should consult the Admiralty List of Lights in the British islands. This Light List is published early in the current year, corrected to the preceding 31st December.



For later information regarding the rights which are  
described in this work, account should be taken of the  
Agricultural list of rights in the British Islands. This  
list is published early in the current year, con-  
sisting of two preceding 81st December.

[Original.]

# NORTH SEA PILOT.

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## PART III.

# EAST COAST OF ENGLAND.

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## INTRODUCTORY CHAPTER.

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### GENERAL REMARKS.—WINDS AND WEATHER.—TIDES.

**General Remarks.**—Before entering into a detailed description of the East Coast of England, and giving directions for it, and the harbours and anchorages between Berwick-upon-Tweed and the North Foreland, a few preliminary remarks may prove useful to the seaman who only occasionally visits this coast, if not to the masters of the coasting vessels and pilots who are constantly passing backwards and forwards to and from the great ports situated here.

In making these remarks, and more especially in describing the prevailing winds and weather, it will be necessary to repeat a portion of what has been already stated in Parts I. and II. of the North Sea Pilot, which treat of the Orkneys, Shetlands, and north and East coast of Scotland ; but it has been thought better to repeat observations on these matters rather than to refer the navigator to another volume which he may not perhaps have at hand.

The navigation of the East coast of England may be divided into two sections—(a) north of the river Humber, where (to as far as North Sunderland) there are no dangers more than one and a half miles from the coast ; and (b) south of the river Humber, where the navigation is rendered difficult by numerous sand banks, forming a series of ridges parallel to the coast, with comparatively deep channels between, which ridges extend in some cases to a distance of 30 miles from the shore. Navigation amongst these ridges in the heavy draught vessels of the present day, would be impracticable were they not marked artificially ; but the admirable system of the Trinity

House in buoying and lighting these dangers, which system has moreover, been much improved and simplified lately,\* leaves little to be desired, so that in fairly clear weather there is no practical difficulty in proceeding either northwards or southwards ; but, in thick weather, too much precaution cannot be exercised ; and, when at all doubtful as to the vessel's position in foggy weather south of the Humber it is far safer to anchor and wait until the fog or mist clears sufficiently to allow a distance of two or three miles to be seen, rather than by proceeding, to risk running on any of the banks, or a collision with another vessel ; for it must be remembered that the tide, in the great majority of cases, sets across the banks, so that if a vessel gets set on shore with the flood she is set more on to the bank the higher the tide rises, and the stream (at springs especially) is much stronger over the ridges than in the channels between.

To the north of the Humber, with the exception of the extreme northern part of the East coast (from Berwick to North Sunderland), there is but little danger, as the few rocks which exist are all close to the land ; it must, however, be borne in mind that between the Humber and the Forth, a distance of 200 miles, there is no harbour that can be run for under all circumstances of wind and weather, and that consequently it is necessary to preserve a due offing in on-shore winds ; for, although the harbours at Shields, Sunderland, Hartlepool, and the Tees, have been immensely improved by the local authorities they cannot be considered as harbours of refuge, and, in point of fact, the Tyne alone has sufficient depth (maintained by dredging) to be entered at all times of tide, and even here, with a severe easterly gale, it is attended with risk to attempt to enter or run for the river, even in a steamer ; more especially when the ebb tide is running, for then there is a most turbulent sea at the entrance, and the channel is too narrow to permit of much variation from the course, so that a sheer either way might put a vessel on shore ; and again, if the entrance be missed through an error in the reckoning, the ship would be on a lee shore with no place of shelter near. The seaman must, of course, be guided by circumstances, but with strong, on-shore winds, and thick weather, when uncertain of the exact position of the ship, the most prudent course is to keep the sea. With off-shore winds the coast, to as far south as the Humber, may be kept safely on board.

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\* For Trinity House Uniform System of Buoyage, *see* p. 12.

As before observed, the navigation from the Humber to the South Foreland is rendered difficult in thick weather by numerous sand banks. The depths between these banks are however sufficiently shoal to permit a vessel to anchor almost anywhere in moderate weather. In strong winds or gales, accompanied by snow, great caution is requisite. No hard and fast line can be laid down as to what is the best course of procedure under all circumstances of wind and weather, but it may be borne in mind that with off-shore gales, the water is nearly always fairly smooth, especially close in-shore or under the lee of the banks, so that anchorage is safe ; and that with on-shore gales the dangerous banks are all marked by heavy breakers, more especially with the tide against the wind, so that it is possible, with due precaution and a strict attention to the soundings, to obtain some shelter under their lee ; moreover, they are all artificially marked, so that by keeping along the lee side of the breakers, at a safe distance, the exact position of the ship may be ascertained and the most prudent course adopted ; bearing in mind that the only really safe harbour between the Humber and the Thames is Harwich, for although vessels may and do ride out heavy gales in Yarmouth Roads, it is not a desirable anchorage, for, with winds from N.E. to S.E., vessels are kept broadside to the wind by the strength of the tidal stream ; and the increase in the depth over the Scroby and Holm banks is a positive disadvantage to the roads, as the more the depths over those shoals increase the less use they are as natural breakwaters from the sea. The holding ground throughout is, however, excellent, and with good cables and a proper regard to keeping the anchor clear, a ship may ride out heavy weather in safety, though with considerable rolling and pitching, especially at high water.

In navigating along the East coast of England, it is well to remember that, as a general rule, the traffic is becoming more and more restricted to steam vessels and fishing vessels, and that they usually meet each other end on, but that in certain localities vessels may be expected to cross the general line of traffic up and down the coast. For instance, the ports in the Humber keep up a constant communication with Holland, Norway and the Baltic. Harwich has a line of steamers running to Antwerp ; from the Tyne steamers run constantly to the continent, Baltic, and Norway, so that in passing those harbours vessels proceeding up and down the coast may expect to meet steamers coming in towards, or proceeding out from, the land. The fishing



boats may be divided into two classes, the drift boats and the trawlers. The favourite spots of the drift net boats are off Berwick-on-Tweed, off Flamboro' Head, the Dogger Bank, and Smith's Knoll. Trawlers are usually seen over, and to the eastward of, the Outer Dowsing shoal, upon the Well and Swarte Banks, &c. Fishing smacks and drift net boats are constantly seen in the neighbourhood of Lowestoft, Yarmouth, and the Humber, the great fishing centres of the east coast of England.

The route up and down the coast will depend naturally somewhat on the port of destination. If from the South Foreland a vessel is bound to the Scottish coast, the route is through the Downs, outside the Kentish Knock, Long Sand, and Shipwash, towards Lowestoft; then, either round the Corton, Cross Sand, and Newarp Sands, into the Would; or through Yarmouth Roads. After passing through the Would, the track is between the Outer Dowsing and Dudgeon Shoals to Flamboro Head. If bound to the Humber, after passing through the Would the track is either between the Dudgeon and Race Bank, or south of the Race Bank; if into the Wash, the track south of the Race Bank and round the Docking may be followed; or if of light draught, the track south of the Docking and between it and Burnham flats; or even along the coast, by Brancaster and Gore Sands. If bound to the Thames, the best channel for heavy draught vessels is the Duke of Edinburgh channel; next, the Alexandra channel; the Prince of Wales channel being only available for vessels of moderate draught; whilst the Gore and Four fathom channels are only used by small vessels.

If from the northward, bound to the Downs, after passing Flamborough Head proceed between the Outer Dowsing and Dudgeon shoals for the Would, then, passing through the Would, proceed either through Yarmouth Roads or Haisboro' Gat and outside the Shipwash, Long Sand, and Kentish Knock, for the Gull Stream. If bound to the Humber or the Wash, keep along the land from Flamboro' Head to Spurn head, then by the Inner Dowsing shoal; if bound to Harwich or the Thames, keep inside the Shipwash and through King's channel or East Swin.

It must, however, be borne in mind that vessels of heavy draught can, at present, only enter the Thames in the day time, at all times of tide, through the Duke of Edinburgh channel. At night time they have to remain either outside or inside the estuary.

**Caution respecting Fog Signals from Lightvessels or Lighthouses.**—Although every endeavour is made to start fog signals as soon as possible after signs of fog have been observed, Mariners should not, when approaching the land or light vessels in a fog, rely implicitly upon these fog signals. They should also remember that the distance at which sound can be heard in a fog, varies exceedingly; and that, in some apparently light fogs, a fog signal will not be heard so far, as in some very dense ones.

No confidence should, therefore, be placed in getting warning by such signals, and on no account should the use of the lead be neglected.

**Winds and Weather.**—The winds and weather over England may be considered from three points of view—(1) the general direction of the wind throughout the year, (2) the prevailing types in summer and winter, and (3) the disturbances occurring at all seasons of the year.

With regard to the general direction of the wind, as well as to the prevailing types, in summer and winter, it is now well established that the course of the wind depends on the pressure of the atmosphere, having a tendency to circulate round areas of high and low pressure, but in different directions; the circulation round the low pressure areas (following invariably the law that holds good in hurricanes and cyclones) is known as the cyclonic system; and that round high pressure areas (exactly contrary to the low pressure system) is termed anticyclonic.

It follows therefore that if the distribution of pressure be known, the direction of the wind can be readily ascertained, and *vice versâ*, if the direction of the wind be known, the direction in which the high and low pressure areas are situated can be determined. A knowledge of this fact is of great importance to the seaman, as he is thus able to avoid standing towards a low barometer, when in his opinion his so doing might lead his vessel into danger. This law, known as Buys Ballot's law, from the meteorologist who first promulgated it, is extremely simple. It is merely "if the face of an observer be directed to the wind, the low pressure area will be on his right, and the high pressure area on his left, in the northern hemisphere;" whilst in the southern hemisphere the low pressure area will be on his left, and the high pressure area on his right.

In considering the mean distribution of pressure and the mean annual direction of the wind, it is necessary to study the varying conditions of the wind and pressure over considerable tracts, thus over the British isles the direction of the wind approximates to the general

circulation of the atmosphere on the adjoining continent, for as the mean pressure in the neighbourhood of Iceland is low, the wind circulates round this low pressure area, consequently the prevailing wind in Greenland is northerly and easterly, on the Danish and Norwegian coast south and south-easterly, and over the British islands west and south-westerly. In accordance therefore with Buys Ballot's law, the mean atmospheric pressure should decrease from the south towards the north, and this observation proves to be the case, as the mean annual pressure at the Shetland isles is 29·78, increasing steadily to 29·96 at Dungeness, the Isle of Wight, Portland and the Start.

Although the mean annual direction of the wind is from the west, easterly winds are by no means uncommon. In point of fact the wind and weather may be divided into two types, the westerly and the easterly, one of which is generally prevailing over Great Britain. With the westerly type of wind the atmospheric pressure is lowest over Iceland, and highest to the southward of the British isles; whilst with the easterly type the pressure is highest in the north, and lowest in the south. The westerly type is most common during the months of December, January, February, July, August and September; whilst the easterly type is most common in March, April, May and November; June and October may be regarded as intermediate months. The characteristic of the westerly type is that the wind commencing at some point of south, with a comparatively high temperature, a dull sky and rain, veers to some point of west with a cooler air and brighter sky, and after a day or so of fine weather backs again to the south with bad weather, sometimes rising to the intensity of a gale, and so on for weeks together. The characteristic of the easterly type is that the wind fluctuates between S.E. and N.E., the S.E. winds bringing foul weather and the N.E. finer weather, veering and backing with many variations for a considerable period. The change from the easterly to the westerly type is often preceded by a movement in the upper clouds. If, with the easterly type prevailing, cirrus and stratus clouds be seen moving from west to east a change is nearly certain to follow.

The general direction of the wind is locally affected by the direction of the coast and valleys, having a tendency to follow their outlines; this is particularly noticeable in fine settled weather with moderate winds. Land and sea breezes are not phenomena of regular occurrence on the East coast of England, but are occasionally observed in fine settled weather during the summer.

Although as previously stated the westerly type of wind is most common in certain months, and the easterly in others, the variable nature of the climate of the British islands does not permit us to predict that such a type will be certain to prevail during the period in which it is most common. Until recently meteorology has received little attention, and accurate observations have been obtained but for a comparatively short period. Over the British isles the observations that have been obtained have however been lately collected in the form of a Meteorological Atlas, which shows the general condition of pressure and temperature for each month of the year, but it is incomplete, inasmuch as there is no record of wind and fog. Until we have the whole information we cannot say we possess a good Meteorological Atlas of the British islands.

**Fogs** may occur at all seasons of the year, but are most common when anticyclonic conditions prevail, especially in the winter. Thick weather, approaching to a fog, is very common. Part of this is doubtless due to the westerly winds blowing the smoke of the great manufacturing districts into the North Sea, for the weather is seldom clear with westerly winds between Flamborough head and the Forth, or off the estuary of the Thames. The N.E. winds of spring bring, as a rule, the clearest weather.

**Gales** or strong winds are by no means unfrequent; they are usually produced by the depressions visiting the British isles, the greatest number of which pass between Ireland and the North-west coast of Scotland, producing gales from S.E., shifting to S.W.; but it is by no means uncommon for them to pass across Great Britain when in that portion of the island, and North Sea, to the southward of their track, the wind will veer to the southward and westward, whilst to the northward of their track it will back to east, N.E., and N.W. Seamen must be guided in their judgment as to the track of the depression by frequent observations of the barometer and the force and direction of the wind, constantly bearing in mind Buys Ballot's law, previously mentioned, and remembering that the harder it blows the greater is the barometric gradient. The usual track of depressions in the vicinity of Great Britain is from some west point to some east point, but the reverse takes place occasionally.

From the records kept by the Meteorological Department of England for the fifteen years 1871-85, it appears that the average annual number

of general gales\* on the N.E. coast of England (from Berwick-on-Tweed to Cromer) is 12, and on the East coast of England (from Cromer to Dungeness) 11.

The following tables of gales have been compiled at the Meteorological Office, London, from data extending over a period of 15 years from 1871 to 1885. The coast is divided into two districts, N.E. England and East England.

The district N.E. England extends from Berwick-on-Tweed to Cromer, and district East England from Cromer to Dungeness.

As regards direction, gales are grouped into four quarters, viz. :—

1. North-easterly gales or gales from between N. and E. by N.
2. S.E.                   "                   "                   "                   E. and S. by E.
3. S.W.                   "                   "                   "                   S. and W. by S.
4. N.W.                   "                   "                   "                   W. and N. by W.

## GALE TABLE I.

TOTAL NUMBER OF GENERAL GALES EXPERIENCED DURING EACH MONTH FROM 1871 TO 1885.

MONTH.	N.E. ENGLAND. Berwick-on-Tweed to Cromer.					EAST ENGLAND. Cromer to Dungeness.				
	Direction.				From all Directions.	Direction.				From all Directions.
	N.Ely.	S.Ely.	S.Wly.	N.Wly.		N.Ely.	S.Ely.	S.Wly.	N.Wly.	
January - -	1	3	15	9	28	5	4	22	4	35
February - -	3	6	6	1	16	2	2	9	—	13
March - -	6	4	8	10	28	5	3	5	4	17
April - -	2	1	2	2	7	2	2	2	1	7
May - -	—	—	2	—	2	—	—	1	—	1
June - -	1	—	3	—	4	—	—	1	—	1
July - -	1	—	1	2	4	—	—	—	1	1
August - -	1	—	3	—	4	—	—	4	1	5
September - -	1	2	3	3	9	1	—	5	1	7
October - -	3	3	10	8	24	4	3	12	3	22
November - -	7	5	8	6	26	6	2	16	5	29
December - -	3	7	8	2	20	—	1	15	6	22

\* By general gales is meant a gale felt at more than half the stations in the district. In these statistics a gale is considered to be a wind of force 8, and upwards, or travelling with a velocity exceeding 40 miles per hour. No gale is recorded that has not been felt at more than half the stations in the district.

## GALE TABLE II.

MEAN NUMBER OF GENERAL GALES EXPERIENCED DURING EACH  
MONTH FROM 1871 TO 1885.

MONTH.	N.E. ENGLAND. Berwick-on-Tweed to Cromer.					EAST ENGLAND. Cromer to Dungeness.				
	Direction.				From all Directions.	Direction.				From all Directions.
	N.Ely.	S.Ely.	S.Wly.	N.Wly.		N.Ely.	S.Ely.	S.Wly.	N.Wly.	
January -	0.1	0.2	1.0	0.6	1.9	0.3	0.3	1.5	0.3	2.4
February -	0.2	0.4	0.4	0.1	1.1	0.2	0.1	0.6	—	0.9
March -	0.4	0.3	0.5	0.7	1.9	0.3	0.2	0.3	0.3	1.1
April -	0.1	0.1	0.1	0.2	0.5	0.1	0.2	0.1	0.1	0.5
May -	—	—	0.1	—	0.1	—	—	0.1	—	0.1
June -	0.1	—	0.2	—	0.3	—	—	0.1	—	0.1
July -	0.1	—	0.1	0.1	0.3	—	—	—	0.1	0.1
August -	0.1	—	0.2	—	0.3	—	—	0.3	0.1	0.4
September -	0.1	0.1	0.2	0.2	0.6	0.1	—	0.4	0.1	0.6
October -	0.2	0.2	0.7	0.5	1.6	0.3	0.2	0.8	0.2	1.5
November -	0.5	0.3	0.5	0.4	1.7	0.4	0.1	1.1	0.3	1.9
December -	0.2	0.5	0.5	0.2	1.4	—	0.1	1.0	0.4	1.5

The following tables give the mean pressure and temperature for  
four selected positions on the East coast of England :—

## TABLE I.

MEAN PRESSURE ON THE EAST COAST OF ENGLAND.

MONTH.	PLACE.			
	North Shields.	Flam- borough Head.	Yarmouth.	Greenwich.
January -	29.830	29.868	29.936	29.960
February -	29.863	29.888	29.948	29.969
March -	29.840	29.854	29.880	29.896
April -	29.910	29.922	29.950	29.951
May -	29.950	29.958	29.990	29.986
June -	29.940	29.952	29.995	29.993
July -	29.895	29.910	29.958	29.966
August -	29.882	29.900	29.945	29.955
September -	29.859	29.884	29.935	29.955
October -	29.820	29.842	29.893	29.903
November -	29.845	29.864	29.890	29.920
December -	29.850	29.890	29.935	29.966
Mean -	29.874	29.894	29.937	29.950



TABLE II.

MEAN TEMPERATURE ON THE EAST COAST OF ENGLAND.

MONTH.	PLACE.				
	North Shields.	Flam-borough Head.	Yarmouth.	Greenwich	
January - -	37·8	38·0	37·8	38·3	
February - -	39·5	39·5	40·2	40·9	
March - -	40·2	40·5	41·5	42·5	
April - -	45·1	46·0	48·0	49·1	
May - -	49·2	50·8	52·2	53·6	
June - -	55·3	56·3	59·0	60·2	
July - -	58·2	60·5	62·0	63·0	
August - -	57·6	59·5	61·0	63·2	
September - -	54·0	55·5	57·2	58·5	
October - -	48·0	48·8	50·7	50·7	
November - -	41·6	42·0	42·7	42·4	
December - -	39·1	38·5	39·1	39·5	
Mean - -	47·1	48·4	49·5	50·2	

**Tides and Tidal Streams.**—On the East coast of England the tidal wave travels from north to south, making it successively high water along the coast. In fact, although the North Sea is open to the tidal undulation coming up the English channel as well as to the undulation passing round the north extreme of Scotland, and between the Orkey and Shetland isles, it is the northern undulation alone which affects the greatest part of the East coast of Great Britain, whilst the channel undulation travels along the coasts of Belgium, Holland, and Denmark, until it finally disappears at the Skaw.

These undulations would appear to travel along the coast in a somewhat similar manner to a wave running along a breakwater, the northern undulation taking about eight hours to travel from Duncansbyness (the north-east point of Scotland) to the Wash, a distance of 350 miles; but, after passing Cromer, its speed quickly slackens, as it takes four hours to travel from Cromer to Orfordness, a distance of only 60 miles. This is due to the fact that the southern part of the North sea (that is, the space enclosed between lines joining Orfordness and the Schelde, and cape Grisnez and Dover) is affected by both tidal undulations, and in this space the high water is practically simultaneous.

The range of tide, at springs, along the coast from Berwick-upon-Tweed to Flamborough head is from 15 to 16 feet. After passing Flamborough head, the range gradually increases to a maximum of nearly 24 feet in the Wash, decreasing again at Cromer to  $14\frac{1}{2}$  feet. From Cromer the range continues to decrease until it reaches a minimum of 6 feet at Yarmouth, after which the channel undulation has the effect of making a second maximum in the estuary of the Thames of from 15 to 16 feet.

The set and direction of the tidal stream along the coast appears to be very perplexing if it is referred to the high waters of the several ports. The general notion that the stream runs swiftly in one direction whilst the tide is rising, and in the opposite direction whilst the tide is falling, and of its having little or no motion at the times of high and low water, is an entirely erroneous one, when dealing with a tide travelling along what is practically a great estuary, and on the East coast of England, for in many places the stream is strongest when it is high or low water by the shore.

The fact is, that in the more or less enclosed seas and channels around England, the durations of the streams are governed by laws which cause them to be connected with the position where the maximum rise takes place. Thus, in the English channel, or rather on the South coast of England, the greatest rise at springs is at Hastings, and the stream will be found running up the channel whilst the tide is rising at Hastings, and down the channel when the tide is falling there. In the Irish channel the maximum rise is at Morecambe bay and Liverpool, and the tidal stream is found to set towards Liverpool when the tide is rising at that port, and away from it when the tide is falling there. On the East coast of England there are two maxima, and the tidal stream has to be referred to these two. To the northward of the Humber and Wash, the stream will be found setting to the southward whilst the tide is rising at Hull, and to the northward whilst the tide is falling there ; whilst to the southward of Cromer the tidal stream will be found setting to the southward when the water is rising at Dover, and to the northward when the water is falling at that place.

The actual change of stream is not simultaneous, being a little before high and low water at Hull, off Berwick-upon-Tweed, and a little after high and low water at Hull, off the Humber ; but practically, a vessel, when to the north of the Humber and at a moderate distance

from the coast, will find the stream setting southwards or northwards, according to the rising or falling of the water in the Wash and at Hull. Now, as the time of high water at the Wash is nearly the same as that at Hull, and as Hull and Dover are standard tide ports, the times of high water at which are given for each day in the annual edition of the Admiralty tide tables, it is a very simple matter to find out how the stream is setting along the coast.

There are some few exceptions to the rule here laid down, especially close in shore, but these exceptions (which are treated in each case as local tides, and described in the text of these directions with the locality) are unimportant, with one exception, viz., the space between Flamborough head and Cromer. Here, although the stream along shore depends on the rising and falling of the water at Hull (or in the Wash), and the stream off Cromer depends on the rising and falling of the water at Dover, the stream outside the line joining Flamborough head and Cromer is affected by both tides. For it will be found that the stream, which off Flamborough head turns at half an hour after high and low water at Hull, or at two hours after high and low water at Dover, is very much retarded in its changes between Flamborough head and Cromer, outside the line joining those two places, whilst inside that line, unless near the coast, the action of the stream is rotatory.

The consequence of this is, that vessels proceeding to the southward, between Flamborough head and the Wold, always have more tide with than against them, whilst in going northwards they have most tide against them. In fact, a vessel passing Flamborough head, when going south, just as the stream was turning to the southward, would, if she steamed 9 knots per hour, gain nearly 20 miles on her passage, and carry the stream for 10 hours right into Yarmouth roads.

**UNIFORM SYSTEM OF BUOYAGE.\***—1. The mariner when approaching the coast must determine his position on the chart, and must note the direction of the main stream of flood tide.

2. The term *Starboard Hand* shall denote that side which would be on the right hand of the mariner either going with the main stream of flood or entering a harbour, river, or estuary from seaward; the term *Port Hand* shall denote the left hand of the mariner under the same circumstances.

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\* Report of the Conference held at the Trinity House, London, 1883, appointed to consider the Proposal for a Uniform System of Buoyage for the United Kingdom.

3. Buoys showing the pointed top of a cone above water shall be called Conical, and shall always be Starboard Hand buoys, as above defined.

4. Buoys showing a flat top above water shall be called Can, and shall always be Port Hand buoys, as above defined.

5. Buoys showing a domed top above water shall be called Spherical, and shall mark the ends of middle grounds.

6. Buoys having a tall central structure on a broad base shall be called Pillar buoys, and like other special buoys, such as Bell buoys, Gas buoys, Automatic Sounding buoys, &c., &c., shall be placed to mark special positions, either on the coast or in the approaches to harbours, &c.

7. Buoys showing only a mast above water shall be called Spar buoys.

8. Starboard Hand buoys shall always be painted in one colour only.

9. Port Hand buoys shall be painted of another characteristic colour, either single or parti-colour.

10. Spherical buoys at the ends of middle grounds shall always be distinguished by horizontal stripes of white colour.

11. Surmounting beacons, such as Staff and Globe, &c., shall always be painted of one dark colour.

12. Staff and Globe shall only be used on Starboard Hand buoys, Staff and Cage on Port Hand, Diamonds at the outer ends of middle grounds, and Triangles at the inner ends.

13. Buoys on the same side of a channel, estuary, or tide-way, may be distinguished from each other by names, numbers, or letters, and, where necessary, by a staff surmounted with the appropriate beacon.

14. Buoys intended for moorings, &c., may be of shape or colour according to the discretion of the authority within whose jurisdiction they are laid, but for marking Submarine Telegraph Cables the colour shall be green, with the word "Telegraph" painted thereon in white letters.

**Colouring of Bouys.**—In carrying out the above uniform system, the colours adopted by the Trinity Houses of London, Newcastle, and Hull, are whole colours on the starboard hand, and parti-colours on the port hand on the east coast of England.\*

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\* The local authorities at Boston, Lynn, and some small harbours along the coast, have not yet adopted this uniform system.

**BUOYING and MARKING of WRECKS.**—15. Wreck buoys in the open sea or in the approaches to a harbour or estuary, shall be coloured green, with the word “Wreck” painted in white letters on them.

16. When possible the buoy shall be laid near to the side of the wreck next to mid-channel.

17. When a wreck-marking vessel is used it shall, if possible, have its top sides coloured green, with the word “Wreck” in white letters thereon, and shall exhibit—

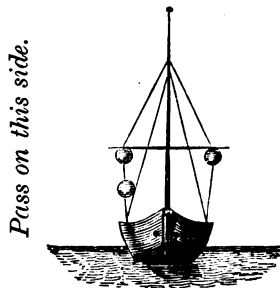
By day : Three balls on a yard 20 feet above the sea, two placed vertically at one end and one at the other, the single ball being on the side nearest to the wreck.

By night : Three white fixed lights similarly arranged, but not the ordinary riding light.

18. In narrow waters or in rivers, harbours, &c., under the jurisdiction of Local Authorities, the same rules may be adopted, or at discretion, varied as follows :—

When a wreck-marking vessel is used she shall carry a cross-yard on a mast, with two balls by day placed horizontally not less than 6 nor more than 12 feet apart, and two lights by night similarly placed. When a barge or open boat only is used, a flag or ball may be shown in the daytime.

19. The position in which the marking vessel is placed with reference to the wreck shall be at the discretion of the Local Authority having jurisdiction.



**LIGHT VESSELS.—Riding Lights.**—For the purpose of showing in which direction the vessel is riding, a white light is exhibited from the forestay of each light-vessel, at a height of 6 feet above the rail.

**Signals.**—When a light-vessel is driven from her proper position to one where she is of no use as a guide to shipping, the following signals are made, viz. :—The usual lights are not exhibited, but a *fixed red* light is exhibited at each end of the vessel, and a *red* flare shown *every quarter of an hour*. By day the balls or other distinguishing mast-head marks are struck. Also, if from any cause the light-vessel is unable to exhibit her usual lights whilst at her station, the riding light only is shown.

If a vessel is seen standing into danger, from a light-vessel a gun is fired, and the signal “J. D.” (Commercial code) is hoisted. The gun is repeated and the signal remains hoisted until observed by the vessel.

The firing of special rockets of little sound but great brilliancy immediately after a gun denotes that the light-vessel has need of assistance from the shore.

Vessels are liable to a penalty of 50*l.* for fouling a light-vessel or a buoy, in addition to the cost of making good any damage so occasioned.

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## CHAPTER I.

BERWICK TO NORTH SUNDERLAND, INCLUDING THE  
FARN ISLANDS.\*

Variation in 1889, Berwick  $19^{\circ} 10'$  W.      Longstone,  $19^{\circ} 00'$  W.

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The northernmost portion of the east coast of England, from the mouth of the Tweed to North Sunderland point or the Snook, is not only the most dangerous section north of the Humber, but also the most interesting historically. Here is situated Holy island, or Lindisfarn, noted as the seat of the first episcopal See of Durham, and as the residence of that ancient father of the English Church, the Venerable Bede ; and here are the Farn islands, projecting from the shore in a right line for a distance of five miles, and noted as the place where St. Cuthbert spent the last two years of his life, and, in later times, as the scene where Grace Darling displayed such heroism in endeavouring to rescue the crew of a shipwrecked passenger steamer. In the vicinity of Holy and the Farn islands are numerous dangers, all of which are, however (with two exceptions), within the contour line of ten fathoms from the coast.

The outer extremity of the Farn islands being a salient point for vessels bound northward or southward is particularly dangerous ; for sunken rocks extend a mile outside the outer island (which is low), and although the lighthouse on that island (The Longstone), with its subsidiary fog signal, is most useful as an adjunct in navigating along shore, yet the thick weather, which so often prevails in the vicinity, frequently prevents either the light or lighthouse being seen, and the seaman can neither rely implicitly on hearing the fog siren, or on judging the distance or direction when he does hear it. The depths, too, increase rapidly from the rocks awash to the north-eastward,

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\* See Admiralty charts of east coast of England : Hartlepool to St. Abbs head with views, No. 1,192 ; scale, mile = 0.5 inch : also, Farn islands to Berwick, with plan of Holy island harbour, and views, No. 111 ; scale, mile = 1.95 inch.

there being 30 fathoms within a mile of the Whirl rock, so that the greatest caution is necessary in thick weather, and the lead should never be neglected.

In dealing with this section of the coast, a general description of the shore and marks employed will be first given, then a description of the dangers in Berwick bay, of Holy island and its harbour, and, lastly, of the Farn islands.

**COAST to the SOUTHWARD of BERWICK.**—The principal objects on the coast immediately to the southward of Berwick are, Sunnyside Hill, 284 feet (to the south-west of Spittal), Berwick hill colliery, the three Scremerston steam mills, Cheswick windmill, Brock mill, and Haggerston castle. On the shore a broad beach prevails to as far as Huds head ; thence to Cheswick the shore is generally rocky, with a narrow band of sunken rocks, and the coast rises into a series of cliffs, which at Maidenkirk point are 87 feet high ; from Cheswick southward is a sandy strand which gradually widens, until at Beal point it connects Holy island with the main at low-water, and forms the extensive tract of sand known as Fenham flats.

Low Lynn, a small mansion 2 miles inland from Beal point, having trees near it, which are used as a leading-mark, stands on a high green hill, one mile to the northward of Kyloe church. Between Low Lynn and Beal point stands the village of Beal on a rising ground, with trees to the northward and eastward.

**Kyloe Hills**, which rise about 2 miles from Fenham flats, are barren ; they have been given distinguishing names by the pilots and fishermen, such as the Scores, Wingate Gap, Laws, &c. Wingate Gap appears as a long curve between the northernmost hill and the next to it ; the Scores are two notches in the same ridge, a little to the southward of Wingate Gap ; and the Laws appears as a long hill, having a hollow near its centre. Kyloe church is half a mile to the north-west of the village, which may be known by a cluster of trees called Kyloe trees. When seen from a position to the northward of Holy island, Kyloe church appears below the ridge, and is thus partially obscured by the background, but from eastward of the Longstone it is clearly seen near the declivity of the northern uncultivated hill.

**FENHAM FLATS**, extending 3 miles in length from Beal point to Old Law, by 2 miles in breadth, are traversed by a small



rivulet which finds its way to the sea through a "low," or depression in the sands ; they are passable for foot passengers in certain directions when the tide is out, but are entirely covered at high-water. From Beal point to Snook point, the western extremity of Holy island, the distance is 1,200 yards, and this part is generally fordable for nine hours out of the twelve. Near Fenham granary, on the western side of the flats, small vessels may approach at high-water, and take the ground with safety.

**Old Law**, a narrow sandy islet three-quarters of a mile long, is separated from the main-land at Ross Links by a gap at its south end, 300 yards in width, called the Wide Open, which admits the water of spring tides. On the northern extremity of the Old Law are two beacons, 122 yards apart, which, kept in line, bearing W. by N., form the leading-mark over the bar of Holy island harbour. These beacons are of the same form (*see* view, page 30), being obelisks of brick painted *red* ; the eastern is 77 feet, and the western 102 feet high above the level of high-water. At 2 cables to the N.N.E. from these beacons is a small islet of gravel, called Black Law, which also serves as a mark ; it is connected with the Old Law at low-water.

**Life-Boat.**—Near the southern end of the Old Law is a life-boat, and a house for the same.

**Ross Links**, a sandy ridge covered with bents, or long grass extends  $1\frac{1}{4}$  mile to the southward of Old Law ; abreast it is the anchorage called Skate road, where vessels may bring up in westerly winds, to wait tide, in from 5 to 8 fathoms at low water, with Farn high lighthouse bearing S.E. *See* page 41.

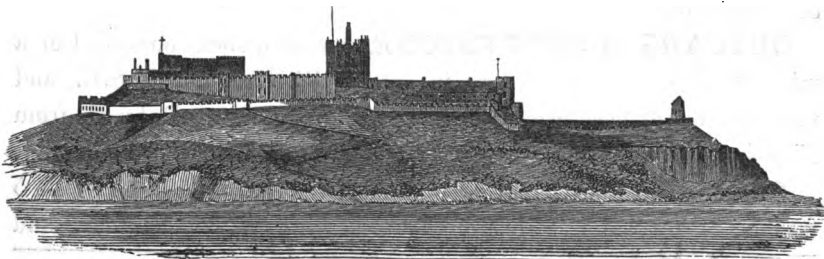
**WARNHAM FLATS**, or Waren flats, immediately to the southward of Ross Links, dry for an extent of one square mile at low-water ; they are traversed by two streamlets, known by the names of Ross and Waren waters, which join before they reach the small pier, which extends from the south shore at Budle, and thence run to Warnham bar, over which is a depth of 13 feet at high-water spring tides, but the bar shifts occasionally.

Budle beacon, at one quarter of a mile west of the granary, in line with the pier-head, bearing S.W. by W., leads up Budle creek after the bar has been crossed ; but the bar should never be attempted without a pilot, or it having been previously buoyed at low water. Pilots can be obtained at North Sunderland or Holy island. There is a small coasting trade in corn carried on from this creek.

**BUDLE POINT and HILLS** bound the south-eastern portion of Warnham estuary. The hills are wild rocky uplands, partially covered with fern ; on their north-eastern extremity is a signal-staff, which is used as a mark in several directions ; a signal-house formerly stood here. Another mark among these hills is one of their summits named Lonsdale hill, or Kettle Bottom (215 feet), and the group terminates to the westward in Outchester bluff. Chester and Easington hills lie farther to the westward, with two or three good farm-houses, which have steam engine chimneys near them, and which must not be mistaken for Outchester tower, which is lofty, and situated to the southward of these. At the south-west angle of Warnham flats is a mill and granary, near which is Waren house, white, with some trees, useful as a mark:

**Black Rocks**, a broad reef, lie to the south-east, three-quarters of a mile from Budle point, and extend eastward 3 cables outside a point to which they give their name. The Herring-house at North Sunderland, kept open to the eastward of the sand-hills to the south-eastward of Bamburgh castle, leads clear of them.

**BAMBURGH CASTLE** standing upon a rock of considerable height rising abruptly from a flat beach, with sand-hills to the north-west and south-east of it, is recorded as having been a fortress in very early times. No building still existing in England has such a definite connection as this with history before the Conquest. The principal tower of this noble and ancient castle (which is inhabited) is square and still perfect ; and the turret on which the flagstaff is placed rises 208 feet above high-water. On the north-eastern outwork is a battery of twelve guns, and part of the tower of a windmill stands at the north-west end. To the westward of the castle lies the village of Bamburgh, with a neat church, the square tower of which is also used as a mark.



Bamburgh castle, S.W.,  $\frac{1}{4}$  mile.

There is a charitable establishment here for the relief of shipwrecked seamen, under the direction of the trustees of Lord Crewe, a former bishop of Durham. Rockets and lines for effecting communication with stranded vessels are kept in readiness. In case of fog a gun (a 4-pounder) is fired every quarter of an hour by day. There is a look-out from the eastern turret, and, in case of need, guns are fired and signals are made to alarm the people on the coast, and to satisfy a vessel in distress that her situation is observed.

**Lifeboat.**—There is a lifeboat at Bamburgh castle.

**Islestone**, a reef of rocks lying three-quarters of a mile south-eastward of Bamburgh castle, projects  $3\frac{1}{2}$  cables to the eastward of the shore abreast, and is covered at half-flood. Ross house, open to the northward of Black Rocks point, bearing N.W. by W. (*see view T.*),\* clears the reef.

**Monkhouse**, about one mile farther to the southward, and close to the beach, is a solitary building, roofed with red tiles, standing among the sand-hills on the sea-shore; rocks extend for nearly half a mile on each side of the entrance of the creek that leads up to it. Here is a landing-place, where fresh water may be had. The neighbourhood is very barren.

**Glororum (or Glour o'er him)** village lies inland, about W. by N.  $\frac{2}{3}$  N., 2 miles from Monkhouse; it stands high, and some trees and a tall steam chimney are conspicuous and useful as a sea-mark. Redbarns consists of a few small houses half a mile to the southward of Bamburgh castle. Greenhill is a farmhouse, with offices, half a mile farther to the southward. Elford is a small village on a rising ground, at some distance to the westward; it has trees about it, and a flagstaff on a mound.

**Shorestone** consists of a farm-house and village, and not far from it, near the shore, is a small steam chimney. New Shorestone is a house and offices, roofed with blue slates, half a mile to the westward of the former.

**OUTCARS of SHORESTONE**, a reef of rocks one-third of a mile off shore, are  $2\frac{1}{2}$  cables in extent, W.N.W. and E.S.E., and uncover only at low spring tides; they lie 6 cables S.E. by E. from Monkhouse, and 7 cables N. by W.  $\frac{1}{2}$  W. from North Sunderland pier.

**Buoy.**—The above reef is marked by a *red conical* buoy, in 5 fathoms at low water, with Monkhouse bearing W. by N.  $\frac{1}{2}$  N., and

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\* The views referred to will be found on the Admiralty chart of this coast from Farn islands to Berwick, No. 111.

the entrance to North Sunderland harbour S.  $\frac{1}{2}$  W. Green hill farm, open north-east of Monkhouse, bearing N.W. (*see* view, page 45), leads clear inshore of the reef, in 6 feet at low water; and North Sunderland cliff, bearing S. by E., clears it passing to the eastward.

**NORTH SUNDERLAND SEA-HOUSES**, three-quarters of a mile farther to the southward, has an outer harbour of 5 acres in area (enclosed by two concrete piers built on a foundation of rock); the entrance is 120 feet wide, and faces North; also an inner harbour about an acre in extent,\* enclosed by two stone piers, built on a foundation of rock, with an entrance between them 21 feet in width, facing E.S.E., and secured by booms in bad weather. The outer harbour has a depth of 14 feet at high-water springs, and 10 feet at neaps, and the inner harbour a depth of 12 feet at high-water springs and 8 feet at neaps; both harbours dry at low-water springs. At the upper or north-western side of the harbour are four disused lime-kilns; and on the rocks, a short distance to the southward of the harbour, is a long building in an east and west direction, called the Herring-house, which is a useful sea-mark. If a vessel be bound in here, she should keep the Megstone and Farn island touching until a pilot comes on board.

**LIGHTS.**—A fixed *white* light, visible between the bearings of South through west to N.W., is shown from a lighthouse on the north-west pier head. Two *red* lights, S.W. by W.  $\frac{1}{2}$  W., 111 yards from each other, are shown, one from the inner arm of the N.W. pier head and the other from the old pier head of the inner harbour. When in line S.W. by W.  $\frac{1}{2}$  W. they lead clear of the rocks to the southward of the harbour, but only 7 or 8 yards clear of S.E. pier head. Caution is therefore requisite. The lights are only shown during the herring season.

**Pilots.**—There are pilots, under a master, at North Sunderland Sea-houses.

**Supplies.**—There are few supplies to be obtained here, and steamers cannot procure coal. It is entirely a fishing place, and the few vessels that visit it annually, about 35 in number, are employed in bringing the materials for curing and packing fish. There is a postal telegraph office at the village, and a railway four miles off. Population in 1881 about 1,000.

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\**See* Admiralty plan of North Sunderland harbour, No. 1632; scale mile = 20 inches.

There are 27 large fishing boats belonging to the place, employing 150 men and boys. The chief exports are corn and fish.

**Life-Boat.**—A life-boat is stationed here, and supported by the Royal National Life-boat Institution.\*

**Car and South Rock Ends** dry out to the extent of  $2\frac{1}{2}$  and 3 cables to the eastward of North Sunderland pier head. They are steep-to, having 10 and 12 feet close to them at low water, and must be carefully avoided in approaching the harbour from the southward. The western part of Green hill farm, open north-eastward of Monk-house, bearing N.W. (*see* view on page 45), leads clear of the Car End and all the other rocks.

**TIDES.**—It is high-water, full and change, near North Sunderland, at 2h. 30m.; springs rise 15 feet, neaps  $11\frac{1}{2}$  feet, and neaps range 8 feet.

**Heifer Law and Hepburn.**—The country in the vicinity of North Sunderland coast is flat, but a few miles inland it rises to a ridge of cultivated land, lying parallel to the coast; and, at a distance of 8 miles to the south-westward, Heifer Law (514 feet) will be seen, with a plantation on the northern extremity of the summit, and a tower on the south-east side; and Hepburn hill (1,029 feet) lies the same distance to the westward; both these hills are used as sea-marks. The summits of some of the Cheviots, which are much higher than Hepburn, as Hedgehope (2,341 feet), &c., are seen farther inland. On the northern declivity of the Great Cheviot (2,670 feet), is a curragh, or heap of stones, piled to a considerable height, as a mark for the shepherds when the hills are covered with snow.

**Snook**, or North Sunderland Point, a cliff above 30 feet high, described on page 45, terminates this portion of the coast.

We now return to the detached dangers in Berwick Bay, to the description of Holy island and adjacent rocks, and the group of Farn islands, with directions for this intricate navigation.

**DANGERS in BERWICK BAY.**—**Spittal Hirst**, a rocky shoal about 3 cables long, in an east and west direction, has 5 fathoms water over it, and from 8 to 10 fathoms around. From the shoalest part Berwick pier-head bears W.N.W.  $4\frac{1}{2}$  miles; Emmanuel head beacon, upon the north-eastern point of Holy island, is in line with the easternmost part of Bamburgh castle, S.  $\frac{3}{4}$  E., a little over 5 miles;

\* The life-boats stationed on the eastern coast of England, with a few exceptions belong to, or are in connection with, the Royal National Life-boat Institution.

and a remarkable round clump of bushes, at a considerable distance inland, is in line with Cheswick, W. by S.  $\frac{3}{4}$  S.

**Inner Hirst**, another rocky patch, over which there is 6 fathoms at low water, lies S.W.  $\frac{1}{4}$  S., a little over a mile from Spittal Hirst. From it Berwick pier bears N.W.  $\frac{3}{4}$  W., distant  $4\frac{1}{2}$  miles; the north-west plantation at Low Lynn, in line with the largest house in Goswick, S.W.  $\frac{1}{2}$  W.; and the west part of Bamburgh castle, in line with the west part of the coves in Holy island, S. by E.

**North Tours**, three-quarters of a mile S. by W. from the Inner Hirst, has also 6 fathoms over it. The marks for it are, Kyloe church, open to the westward of the village of Beal, bearing S.W.; and the signal-staff on Budle hill, open to the eastward of the priory at Lindisfarn, S. by E.

It may be observed that the Pilots at Holy island differ in the names they give to these shoals.

**Outer Tours**, with 6 fathoms over it, is two-thirds of a mile E. by S.  $\frac{1}{2}$  S. from North Tours.

**Tours Reef**, S.E.  $\frac{1}{4}$  S.  $1\frac{1}{2}$  mile from North Tours, and close to the northward of and parallel to Park-dyke, has 2 fathoms on its shoalest part, and  $4\frac{1}{2}$  fathoms close to its edge. The marks for its eastern end are, Bamburgh castle, just open to the eastward of the beacon on Emmanuel head, bearing S.  $\frac{1}{2}$  E., and Berrington old hall, open to the northward of the new hall at Goswick, West.

**Park Dyke**, the south-eastern shoal of this group, half a mile long in an east and west direction and a cable in width, lies 2 miles N. by W. from Emmanuel head. and has only 9 feet water on its shoalest part, with 5 fathoms close to. The marks for its eastern end are, Bamburgh church, in line with the beacon on Emmanuel head, bearing S.  $\frac{1}{2}$  E.; Holy island castle, over False Emmanuel head, S.  $\frac{1}{2}$  W.; and Berrington hall, nearly in line with Goswick new hall, W.  $\frac{1}{2}$  N.

**Wingate Reef**, lying to the westward of Park-dyke, extends nearly a mile in a W.S.W. and E.N.E. direction, and nearly joins the shoal water from the shore; on its shoalest part there is a depth of only 9 feet. From its eastern extremity the beacon on Emmanuel head bears S.S.E.  $\frac{1}{4}$  E., distant  $2\frac{1}{2}$  miles; Berrington new hall is just clear to the northward of Goswick new hall; and Farn island high light-house, a little open to the eastward of the beacon on Emmanuel head, S.S.E.  $\frac{1}{4}$  E. From the western end of the shoal the signal-staff on

Budle hill is in line with the west end of the Heugh of Holy island, bearing S. by E.  $\frac{1}{4}$  E. The low water margin of the main now extends so near to this reef that no vessel should use the narrow passage between.

**Beanstack** is a rocky shoal of 9 feet, close to the northward of Wingate reef, and nearly parallel to it. From its eastern end, the beacon on Emmanuel head bears S.S.E.  $\frac{3}{4}$  E., distant  $2\frac{3}{4}$  miles, and Holy island castle appears in line with the centre of the banks near Snipe point, S. by E.  $\frac{1}{2}$  E. The west end lies with the signal-staff on Budle hill, just open to the eastward of the belfry on Holy island, bearing S. by E.  $\frac{1}{4}$  E.; and Wingate gap in line with the southernmost houses at Beal, S.W. by W.

**North Beanstack.**—A large tract of foul ground, called the North Beanstack, lies to the north-westward of the Beanstack, and extends about half a mile in a W. by N. and E. by S. direction, its least depth being 5 fathoms. Kyloe church seen to the northward of Beal trees leads over it.

**DIRECTIONS.**—The signal-staff on Budle hill brought in line with the beacon on Emmanuel head, bearing south (view B.), is the general mark for clearing all the shoals in Berwick bay; and vessels bound to Berwick should not cross this line till Berwick pier lighthouse bears N.W. by W.  $\frac{1}{2}$  W.; they may then close the harbour, passing between the Spittal Hirst and Inner Hirst.

By night, Farn high light must not be brought to bear eastward of S. by E., or the low light opened out.

**TIDES.**—It is high water, full and change, at Berwick, at 2h. 18m.; springs rise 15 feet, neaps  $11\frac{1}{2}$  feet, and neaps range 8 feet. In Berwick bay the direction of the flood stream varies from S.S.E. to S.E., and the ebb *vice versâ*, the inshore portion of the streams following the curvature of the strand: the fishermen state that there is an indraught after strong easterly winds.

**HOLY ISLAND\*** (anciently Lindisfarn, from the little river Lindis and the Celtic word Fahrea) is of a quadrangular form, about  $1\frac{1}{2}$  square mile in area, with a long narrow edge of low sand-hills, locally termed the Snook, extending from its north-western angle nearly 2 miles in a W.N.W. direction towards the main land at Beal point. On the island there is scarcely a tree or shrub, but it contains

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\* See plan of Holy island harbour, with views, on Admiralty chart, Farn islands to Berwick, No. 111.

some good corn land, and produces lime and iron stone. The Snook end is separated from the main by a sandy track 1,200 yards wide, which is generally covered by the sea for three hours out of every twelve ; thus rendering Holy island, as Bede terms it, only a semi-isle. The village, the ruins of the stately priory, the castle, the church belfry, the beacon on the Heugh, and the square building near it, are all used as marks in the navigation of the coast and harbour. Population in 1881 was 546.

The main body of the island is based on limestone rock, which, on the northern, eastern, and southern sides, extends seaward fully 400 yards at low water ; on the west side, as before observed, is a waste of sand known as Fenham flats. On the south-west part of the island is the village of Lindisfarn, inhabited chiefly by fishermen, including 34 pilots and a buoy master, under the jurisdiction of the Trinity House of Newcastle ; it consists principally of thatched and whitewashed cottages. Near the south-east point is the castle, a very conspicuous object on a picturesque rock, with its summit 108 feet above the level of high water, and a limekiln adjoining it to the eastward ; otherwise, the island is a moderately elevated plain sloping to the south-west. The landing place is a little cove between the castle and the ruins of the abbey.

The only communication with the island is by wheeled carriages across the sands at low water. Beal, on the North Eastern Railway,  $4\frac{1}{2}$  miles distant, is the nearest telegraph station.

**Emmanuel Head**, the north-east point of Holy island, is a cliff barely 10 feet high, on which is a sharp pointed stone pyramid, painted *white*, its summit reaching 48 feet above high-water. The first projection westward of Emmanuel head is called False Emmanuel head, and the second Snipe point. Between the latter points are two sandy coves, fronted by rocks which extend one-third of a mile off shore. From Snipe point, a ridge of low sand-hills stretches nearly 2 miles about W.N.W. to Snook end, having an old wind-mill tower near its extremity. On the north side of this sand ridge is Swinnow Goat, or Gut, through which the flood tide first enters to cover the flats.



Emmanuel head  
beacon.

**The Heugh** is a green hill at the south-west angle of the island, bordered by a dark-coloured rocky cliff, 45 feet high, towards the harbour. About midway along the hill is a wooden signal-beacon



with a triangular head and mast, its summit 80 feet above high-water. Towards the western extremity of the Heugh is a small roofless building, called the Look-out ; to the northward of the latter are the ruins of the priory ; and to the west of the ruins is the church, the belfry of which is a useful mark for leading into the harbour. The village lies to the northward of the priory.

**HOLY ISLAND HARBOUR**, though secure and well sheltered, is very small, the anchorage off the Heugh being only two cables in extent, with depths of 18 to 24 feet at low water over its deeper parts. It has a very deceptive spacious aspect at high water. It is a busy place during the herring fishery. The entrance is between the south-east point of Holy island and the flat which extends from the Old Law.

This harbour has proved useful for refuge to many vessels ; 47 fishing boats belong to the place. There are several springs of fresh water on the island. The population of the village and island in 1881 was 546. The buoys and beacons about Holy island are under the jurisdiction of the Trinity house of Newcastle ; the lighthouses on Farn islands are under that of the Trinity house of London.

**Supplies.**—Coal is not kept in stock, but could be obtained from Scremerston colliery, price about 14s. per ton ; in fact, all supplies, except, perhaps, potatoes, have to be obtained from the mainland.

**Life-Boats.**—There are two life-boats belonging to Holy island : one boat being stationed at the island, and the other near the southern end of the Old Law, which is manned by a crew from the island in the event of a wreck occurring to southward of the harbour. Rocket apparatus is also provided.

At about one cable from the western point of the Heugh is a small rocky projection which at high-water forms an islet, but is connected with the Heugh at low-water. It is called St. Cuthbert isle, and is the Hob Thrush of the pilots. A cove called the Ooze, on the east side of the Heugh, being dry at low-water, and clean, is a convenient place for vessels taking the ground to repair.

On the south and west sides of the harbour is a sand and gravel beach, but near low-water mark there are some shoals and rocks to be noted.

**Long Bat and Sand Bat** are spits of shifting sand from Fenham flats, to the north-west and south-west of the anchorage. The Long bat has extended considerably in consequence of a wreck in the

harbour ; this wreck has now (1887) been blown up, and it is hoped this bank will resume its former dimensions.

**Seal** is a shoal with 3 feet over it, 2 cables N.N.E. of Black Law, and only half a cable to the westward of the direct course to the anchorage.

**Law Scarp**, a patch of stones  $1\frac{1}{2}$  cable E.S.E. of Black Law, dries at low-water.

**Nob** is a small mass of sand, with only 6 feet over it, lying on the south-west side of the entrance channel, with the high beacon on the Old Law just open to the south-westward of the low beacon. As the Nob is only a ship's length to the southward of the turning point of the leading marks into the harbour, the seaman must be careful when altering the course to haul to the northward in good time.

**Parton Stiel and Bat**.—Parton Stiel is a stony patch projecting half a mile East from the centre of the Old Law, and uncovered at low-water. This patch, and the Bat, a shoal with 3 feet on it one-quarter mile to the south-east, may be said to form the south-west side of the entrance to the harbour.

On the north-east side of the channel the dangers are :—

**Stone Ridge**, a reef extending half a mile about N.W. and S.E., in connection with the low-water shore of the island, is covered 3 feet at high-water springs, and when its top is just visible above the surface of the water, there is a depth of 20 feet over the bar in the line of the leading marks.

**Middles**.—A patch of foul ground called the Middles, with only 3 feet water over it, projects from the centre of the Stone Ridge towards the fair-way. As the line of the leading mark passes only a ship's length to the westward of this patch, great care must be observed not to open the belfry to the eastward of the Heugh beacon. The channel between the Middles and Law Scarp is only one cable in width.

**Wheel Rig** is a very small detached 3-feet shoal, lying off the north-west end of the Stone Ridge.

**Ridge End**, a detached rocky patch, with from 2 to 5 feet water over it, and with spits of foul ground projecting from it to the eastward and southward, lies south of Castle point, and between Burrows Hole and Hole Mouth, which are two gaps in the reef of rocks which fringes the island on this side.

**Buoy.**—A *red* conical buoy lies at the south-eastern side of the Ridge End, in about 5 feet at low-water ; with Holy island castle bearing N.N.W.  $\frac{3}{4}$  W. ; the beacons on the Old Law, W.  $\frac{1}{2}$  S. ; and Plough rock beacon, N.E.  $\frac{3}{4}$  E. In northerly winds, a vessel drawing 9 feet may round close to the southward of the buoy, after half-flood.

**The Yares**, at 2 cables to the south-west of the castle, are the highest part of the flat foreshore, and when they are covered, there is a depth of 11 feet over the bar in the line of the leading marks.

**HOLE MOUTH**, the small opening between Castle point and the Ridge End, has a depth of 6 or 7 feet at low-water. Vessels driven too close in-shore to weather the Ridge End, have in several instances been saved from destruction by boldly running into this hole.

**OFFING DANGERS S.E. of HOLY ISLAND.**—There are several outlying reefs to the south-eastward of Holy island ; the outermost of these, the Goldstone, Guzzard, &c., are connected both with Holy island and Farn islands by a bank, or broad ridge, having only 7 fathoms over it, while between Farn island or the Inner Farn and the mainland is a depth of from 10 to 12 fathoms ; the innermost danger, the group of the Plough, consisting of the Plough rock, Plough Seat, Wingate and Minscore reefs, is closely connected with Holy island by a 4-fathom bank.

**Plough Rock**, E.  $\frac{3}{4}$  S. nearly three-quarters of a mile from Holy island castle, uncovers for about 40 yards at half-ebb, and is 7 feet in height at low-water.

**Beacon.**—On the north-western extremity of Plough rock is a black wooden beacon or perch, reaching to 8 feet above high-water, with a ball on its summit. The marks for this perch are, the Heugh beacon just open to the northward of Holy island castle W. by N. ; and the hollow to the west of Kettle-Bottom hill, in line with the east end of the granary at Budle pier, bearing S.  $\frac{3}{4}$  W.

**Plough Seat** is a narrow reef partly visible at low tide, extending E. by S.  $\frac{1}{2}$  S. one-third of a mile from Plough rock. The marks for the eastern end are, the beacon on the Heugh, just open to the northward of Holy island castle, bearing W. by N. northerly ; and Hepburn hill (10 miles distant), in line with the highest house in Ross village, S.W.  $\frac{1}{4}$  S.

**Buoy.**—A *red* conical buoy generally lies in  $4\frac{1}{2}$  fathoms at low-water off the eastern end of the Plough Seat, but in heavy gales it is sometimes driven a cable to the south-westward.

**Wingate**, bearing E. by N.  $\frac{3}{4}$  N., nearly one-quarter of a mile from the Plough beacon, is visible at very low spring ebbs.

**The Patch** is a small rock half a cable S.E. of the Wingate.

**Outer Wingate** is a small rock on which the sea generally breaks, having only 6 feet over it at low water ; it lies E. by N.  $\frac{1}{2}$  N. four cables from the Plough beacon, with the ruins of Lindisfarn priory, in line with the north end of Wingate Gap, bearing W.  $\frac{1}{2}$  N. ; and St. Cuthbert tower on the Farn, open to the west of the Megstone at low-water, S.S.E.  $\frac{1}{4}$  E.

**Minscore**, the northernmost of the Plough group, N.E.  $\frac{1}{4}$  E., four cables from the beacon, has a depth of 9 feet upon it at low-water. The marks for it are, Black Law, just clear of the high-water margin at Castle point, bearing W. by S.  $\frac{3}{4}$  S. ; and the ruins of the priory, in line with Wingate Gap, W.  $\frac{1}{4}$  N.

**Goldstone** is a dangerous rock E. by  $\frac{3}{4}$  S.  $1\frac{1}{2}$  miles from the Plough rock beacon, leaving a channel between it and the shoal water to the eastward and north-eastward of the Plough rock one mile in width. The highest part of the Goldstone is 4 feet above low-water, and it is therefore only visible for about three hours at spring tides. The marks for it are, the Look-out on the Heugh, just touching the south side of Holy island castle, bearing W. by N.  $\frac{1}{2}$  N. ; and the Megstone, half its breadth open to the westward of Farn island, S. by E.  $\frac{1}{4}$  E. When on this rock, the towers of Farn lighthouses do not show open of each other, and, in consequence of the distance between them being so small, they form a slow and uncertain mark for Goldstone channel. A beacon on this rock would facilitate navigation.

**CAUTION.**—A *black* can buoy usually lies in  $7\frac{1}{2}$  fathoms at low-water at the west end of the Goldstone, but it is sometimes driven from thence  $1\frac{1}{4}$  cable to the south-west of the rock, where it generally holds on ; the uncertainty of its position, as well as that of the Plough Seat buoy, should always be remembered when navigating between these dangers.

**Stiel Reef** extends E.S.E. 4 cables from the Goldstone rock and is partially visible at low ebbs. From its eastern end, the north side of the Heugh is touching the south side of Holy island castle, bearing

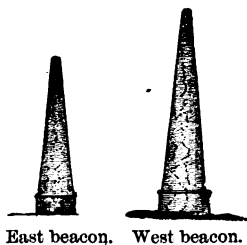
W. by N.  $\frac{1}{2}$  N. ; and the Megstone is well open to the eastward of North Sunderland point, S.  $\frac{3}{4}$  E.

**St. Nicholas Rock**, N.N.W.  $\frac{1}{2}$  W.,  $3\frac{1}{2}$  cables from the Goldstone, has 15 feet water over it, but the sea often breaks heavily over this danger. Its marks are, Kyloe (St. Nicholas) church, just open to the north of Holy island castle, bearing W. by N. ; and the east side of the Megstone, just open to the westward of Farn island, S. by E.  $\frac{1}{4}$  E.

**Guzzard**, a rocky shoal, with a depth of 2 fathoms over it at low-water, lies S.  $\frac{2}{3}$  E. half a mile from the Goldstone ; it extends to the westward almost to the line of Farn lighthouses over the Megstone, where it deepens to 3 fathoms. From its centre, the easternmost part of the Megstone is in line with the western part of Farn island, bearing S. by E.  $\frac{1}{4}$  E. ; and the beacons on Old Law are in line with the south part of Wingate Gap, W. by N.  $\frac{1}{4}$  N.

**Tree-o'-the-House**, a rocky spot with  $4\frac{1}{4}$  fathoms water over it, lies S. by W., half a mile from the Guzzard ; with St. Cuthbert tower, just to the westward of the highest part of the Megstone, bearing S.S.E. ; and a large house at Outcheater, in line with the granary at Waren bridge, S.W.  $\frac{1}{2}$  W. Another patch of  $4\frac{3}{4}$  fathoms lies in the fairway between Plough Seat and Goldstone rock.

**DIRECTIONS for Holy Island Harbour.**—In coming from the northward, vessels may proceed through Goldstone channel by keeping the lighthouses on Farn island (*see* page 32) in line, over the centre of the Megstone, bearing S. by E.  $\frac{3}{4}$  E., (view E.)\* or by keeping Outcheater tower, in line with the north-west chimney of Waren house, S.S.W.  $\frac{3}{4}$  W. (view M.) ; until the obelisk shaped beacons on Old Law (view F.) appear in line, bearing W. by N. ; proceed with them so, until the beacon on the Heugh comes in line with the church belfry, bearing N.W. by N., northerly (view I.), when this latter mark will lead up to the anchorage. It is necessary to be very careful to keep the leading marks on and to alter course quickly from one mark to the other as the channel is very narrow. The depth over the bar is 8 feet, and abreast the Heugh from 18 to 24 feet at low-water.



The ebb stream runs out of the harbour with great rapidity, and

\* The views referred to are on chart No. III. Farn islands to Berwick.

forms a race in the centre of the channel, which the pilots avoid by edging over on one side ; this, however, can only be done by persons well acquainted with the place. The marks for entering as given above are very distinct, but the narrowness of the channel will not allow of any freedom being taken with them by a stranger, and they should be kept exactly in the line as directed.

When the weather is rough and pilots cannot get off, the flag-staff of the beacon on the Heugh will be struck across, as shown in Fig. 2, until the proper period of tide for vessels to enter, when it will be raised erect and a *blue* flag hoisted, as represented in Fig. 1.

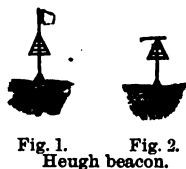


Fig. 1.

Fig. 2.

Heugh beacon.

**Inside the Plough.**—Vessels obliged to take the channel inside the Plough must keep the east end of Budle granary just open to the westward of Kettle Bottom hill, bearing S.  $\frac{1}{4}$  W., which clears the Ridge End, till the beacons on Old Law come in line as before.

**From the Eastward.**—A vessel outside the Goldstone and all the shoals, which may be known by the Herring-house at North Sunderland being open to the eastward of the Megstone, bearing S.  $\frac{1}{4}$  W., or when Farn high lighthouse bears to the westward of South, may pass between the Goldstone and the Guzzard with the beacons on Old Law in line, W. by N. (view F.), and then into the harbour as before directed.

**From the Southward.**—After passing outside the Megstone, or inside of the Swadman, vessels may edge away at once through Skate road towards the mouth of the harbour, only taking care to avoid the bar at its entrance by keeping the east end of Budle granary open to the westward of Kettle Bottom hill, bearing S.  $\frac{1}{2}$  W. Farn lighthouses open to the westward of the Megstone clears the Guzzard to the westward, while the mark for clearing the Bat is the church belfry open to the north-eastward of the beacon on the Heugh, bearing N.W.  $\frac{1}{2}$  N.

The mark for entering Hole Mouth is the Heugh beacon just touching the northern side of the Look-out, bearing N.W. by W., westerly, when the church belfry will also be just clear of the angular part of the ruins of the priory.

When there is not sufficient water over the bar to enter Holy island harbour, vessels may await tide time by anchoring in Skate road, directions for which are given on page 41.

**TIDES.**—It is high-water, full and change, at Holy island harbour at 2h. 30m. On the bar, springs rise 15 feet, neaps  $11\frac{1}{2}$  feet, and neaps range 8 feet.

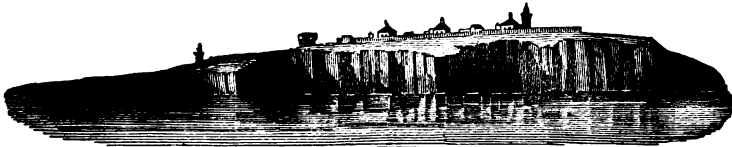
The tidal stream into and out of the harbour changes at high and low water by the shore, the flood stream running into the harbour W.N.W. and the ebb stream running out E.S.E. In the offing the south going stream runs until 3 hours after high water by the shore.

### FARN ISLANDS.

Farn islands or Staples are two rocky groups, 3 miles in extent, in a N.E. by E. and S.W. by W. direction, the innermost island of the group being  $1\frac{1}{2}$  mile to the eastward of Bamburgh castle. Like the generality of small islands where there is a considerable rise and fall of tide, they present very different aspects at high and low water, and the navigation is thus rendered additionally dangerous.

There are two sounds or passages for shipping ; that between Farn island and the main land called the Inner sound, and the other between the two groups called Staples sound ; the former is  $1\frac{1}{10}$  mile, and the latter half a mile wide at low-water.

**FARN ISLAND**, originally named House island, the nearest to the main, is the highest of the cluster ; on the south-west side it has a bold cliff of columnar basalt 45 feet high, which slopes gradually to the north-east ; its whole length from north-west to south-east being 520 yards. Its area is about 16 acres.



Farn island, East, half a mile.

On the north-east part of the island is St. Cuthbert tower, an old square building, formerly used as a lighthouse, already referred to ; and near to it an old house apparently built of the ruins of a chapel. The surface of the island is covered with Farn grass ; the only residents are the four lighthouse keepers and their families. At a short distance to the eastward of the low lighthouse is a cavity in the rock, with a hole above, through which in north-east gales the sea is

forced, and forms a *jet d'eau* called the Churn. The landing place is at a small bay on the north-east end of the island.

**Signals**, by a *black* ball in day time, and rockets at night, are made from Farn island when a life-boat is required in the neighbourhood.

**LIGHTS**.—There are two lighthouses on Farn island ; both the light-towers are coloured white, as are also the detached dwellings of the light-keepers, and the enclosure wall.

The high lighthouse stands about 27 yards from the south-west cliff and the centre of the lantern is 87 feet above the level of high water. The light is *flashing white and red*, showing two *white* flashes, followed by a *red* flash, the duration of the flashes as well as the duration of the eclipses being *twenty* seconds, and is visible at 15 miles distance all round the compass. The low lighthouse near the north-west point of the island bears N. by W.  $\frac{1}{2}$  W. westerly, 187 yards distant from the high lighthouse, and exhibits a *fixed white* light, at 45 feet above high-water, only seen in a northerly direction, between the bearings S.S.E.  $\frac{1}{2}$  E. and S. by E. ; it is visible in clear weather 12 miles. The lights in line, bearing S. by E.  $\frac{1}{2}$  E. easterly, lead between the Goldstone and Plough Seat, but directly over the Megstone.

**Wide Opens** are two rocky islets lying E.S.E. from Farn island, they have rugged cliffs to the south-west, and slope gradually to the north-east.

**Scarecrows and Bush**.—A little farther to the eastward are two black rocks always above water, called the Scarecrows, to the E.S.E. of which Bush reef partly visible at low water springs, extends one-quarter of a mile. The marks for the eastern extremity of this reef are, the windmill tower on the north-west end of Bamburgh castle in line with the south-east cliff of the easternmost Wide Open ; and the south end of the granaries at North Sunderland Sea-houses open to the north of the plantation on Heifer Law. The signal-staff on Budle hill, open to the southward of Farn island, bearing W. by N.  $\frac{3}{4}$  N., leads to the southward of the Bush and the other shoals of the group.

**Knox reef**, visible at low-water, extends two-thirds of a mile to the eastward of Farn island, from whence the water deepens to 12 fathoms in Staples sound. The limekilns at North Sunderland, in line with the east Scarecrow, bearing S.W. by S. ; and Hepburn hill, midway between the lighthouses on Farn island, W. by S.  $\frac{1}{2}$  S., are



the marks for this low water extremity ; they are here given because no satisfactory mark can be furnished for leading through Staples sound, and they might, therefore, in conjunction with the lead, as the soundings are pretty regular, be useful in an emergency.

**Kettle.**—The north-western angle of Knox reef forms with Farn island a small basin called the Kettle, having from 7 to 12 feet water in it, over a sandy bottom. The entrance is from the northward, and when proceeding in, keep in mid-channel with the beacon on Emmanuel head just touching the east side of the Megstone, remembering to allow for the set of the tide. Anchor abreast St. Cuthbert tower.

**Megstone**, a black rock with its summit about 16 feet above high-water, is a most useful leading mark. It lies N. by W.  $\frac{1}{2}$  W. westerly one mile from the high lighthouse on Farn island. There is a depth of 4 or 5 fathoms within 20 yards of its eastern side, but from the opposite side a reef, partly visible at low water, extends W.  $\frac{1}{4}$  N about half a mile.

**Swadman**, the western extremity of the reef from the Megstone, is marked by a *black* can buoy, from which Farn high lighthouse bears S.E.  $\frac{1}{2}$  S.,  $1\frac{1}{4}$  mile, and Longstone lighthouse E.  $\frac{1}{4}$  N.  $2\frac{3}{4}$  miles. From the western end of the Swadman, Bamburgh church is in line with the highest sandhill near it, lying to the northward of the castle bearing S.W. by W.  $\frac{1}{2}$  W.; and the base of the eastern beacon on Old Law is seen clear of the adjacent sand-hills, N.W.  $\frac{1}{4}$  N.; but as these marks are not very plain, and as the buoy might be driven from its position, the western end of the reef will be avoided by keeping the Heugh beacon on Holy island, in line with the church belfry, bearing N.W. by N. northerly, when the base of Old Law east beacon will be shut in behind the low point of the sand-hills.

**Elbow** is a small rocky shoal, with only two feet over it at low water, E.  $\frac{1}{4}$  S.,  $2\frac{1}{2}$  cables from the Megstone, and much in the way of vessels passing between the latter and the Oxscar. It lies with the low houses at Shorestone just open to the southward of the south part of Heifer Law; and Farn high lighthouse, appearing between St. Cuthbert tower and the low lighthouse, but rather nearer to the latter, bearing South, easterly.

**Oxscar** is a small rock, about 6 feet above low-water, lying nearly half a mile N.E. by E.  $\frac{1}{2}$  E. from the Megstone, and N.  $\frac{1}{4}$  E. from Farn high lighthouse. The marks for this half-tide rock are, the

keep of Bamburgh castle in line with the Megstone, and Farn high lighthouse appearing midway between St. Cuthbert tower and the low lighthouse. A reef extends from it  $1\frac{1}{2}$  cable to the westward.

**Glororum Shad**, with 2 fathoms over it at low water, bears from Longstonelighthouse West, and from Farn high lighthouse N.N.E.  $\frac{1}{4}$  E., distant  $1\frac{1}{4}$  mile. The marks for the shoalest part of this patch are Dunstanburgh castle in line with the west part of the east Wide Open S.  $\frac{3}{4}$  W.; and the signal-staff on Budle hill, in line with the north part of the Megstone, bearing W.  $\frac{1}{3}$  S.

To the north-east of Glorum Shad there is foul ground, but with comparatively deep water over it; upon one spot, however, there is only 5 fathoms, with Bamburgh church, in line with the Megstone, bearing W. by S.  $\frac{3}{4}$  S.; and the east point of the eastern Wide Open islet, open of North Sunderland point, S. by W.

**Islestone Shad**, over which the sea generally breaks, is a small rocky patch, with but 9 feet over it at low-water. From it Farn high lighthouse bears S.W.  $8\frac{1}{2}$  cables; Longstone lighthouse, E. by N.  $\frac{3}{4}$  N.; Dunstanburgh castle appears just open to the eastward of the east Wide Open, S. by W.; and Islestone rocks (on the coast), in line with Hepburn hill, W. by S.  $\frac{1}{2}$  S.

**STAPLES.**—The islet called the Staples, a name often applied to the whole group, is the westernmost of the outer cluster of islets. It is of a triangular shape, having a square building on it, the remains of a former lighthouse. Its southern side is a bold cliff, with some detached rocks, called the Pinnacles, which have the appearance of broken pillars. The whole island is covered with birds; gulls, puffins, tern, guillemots, and kittiewakes all breed here, and add their discordant voices to the noise of the breaking sea. From its south-west point, a sunken danger called Gun reef extends one-quarter of a mile to the north-west, having towards its outer end two patches of rock named Gun rock, uncovered before half-ebb. The tangle shows along the reef at low water. The plantation on Heifer Law, open to the north-west of North Sunderland Sea-houses, bearing S.W.  $\frac{3}{4}$  S., is the mark for the western extremity of this reef.

**Brownsman Isle** almost joins Staples islet, and has near its north-west end the square tower of its old lighthouse. Close to the northward of the Brownsman lie two rocky islets, the Wamses (on which the Eider duck breeds), from which a reef projects to the

north-west and north-east for about one cable ; and other islets, called **Hawker** and **Blue Caps**, are immediately to the eastward of the **Wamses**.

**LONGSTONE**, so called from its form, lies three-quarters of a mile N.E. by E.  $\frac{3}{4}$  E. from the old tower on the **Brownsman**. At low-water it forms one narrow islet half a mile long, but which is separated into several parts at high-water. Its eastern side, which is very rugged, is the highest.

**LIGHT**.—A lighthouse, built in 1826, and painted red, stands on the western side of Longstone islet. The light is *white* and *revolving*, showing a *bright flash every half-minute*, and may be seen in clear weather a distance of 15 miles ; the lantern is 75 feet, and the top of the vane 85 feet, above the level of high-water. From it, Farn high lighthouse bears S.W. by W.  $\frac{1}{2}$  W.

**Fog Signal**.—During thick or foggy weather a horn gives *two* blasts in quick succession *every two minutes*.

An extensive reef of rocks fills up the space between the **Wamses** and the **Longstone**, and from their northern points shoal water extends one cable.

**Knavestone** is the easternmost rock that dries, its summit being 11 feet above low-water, thus showing at two hours' ebb. It is nearly half a mile distant from the **Longstone**, and Farn high lighthouse, in line with **Longstone** lighthouse, bearing S.W. by W.  $\frac{1}{2}$  W., leads over it. A beacon here would be advantageous.

**Whirl Rocks** are one-quarter of a mile to the north-east of the **Knavestone** ; one of them has only 2 feet over it, while the others have from  $2\frac{1}{2}$  to  $3\frac{1}{2}$  fathoms over them ; from the outer part, **Longstone** lighthouse bears S.W. by W., distant three-quarters of a mile. As the tide streams near these rocks and the **Knavestone** are extremely rapid, and whirl in various directions, vessels are recommended never to approach them nearer than two miles.

**Crumstone**, which is the southernmost of the **Staples** group, is a flat black rock, partly covered at high-water, and from it **Longstone** lighthouse bears N.  $\frac{1}{4}$  W., about one mile distant.

**Callers**.—A reef called the **Callers** extends nearly 3 cables from the **Crumstone** to the north-west, and from its extremity **Longstone** lighthouse bears N. by E. ; the northern side of the **Megstone** touches the south-west point of **Staples** islet W. by N.  $\frac{1}{2}$  N. ; and **Glororum**

engine chimney is in line with Farn high lighthouse, W.  $\frac{1}{2}$  S. ; rocks also extend for one cable to the south-eastward.

**Fang** is a small rock, with a depth of 9 feet over it at low-water, about one cable S.W.  $\frac{1}{2}$  S. from the Crumstone ; with the south part of Bamburgh castle, in line with the north side of St. Cuthbert tower, bearing W.  $\frac{1}{3}$  N.

**Anchorage.**—On the south side of Farn island and of the Wide Opens is a depth of 9 fathoms, with a sandy bottom, where Longstone lighthouse is just open to the south-eastward of these islands, bearing N.E.  $\frac{2}{3}$  E. ; and Farn high lighthouse, N.W.  $\frac{3}{4}$  N. ; or Holy island castle is in line with the south-west cliff of Farn island ; and there a vessel may anchor during northerly winds.

On the north side of the Farn is a small space where a vessel may anchor for a tide during southerly winds, on shingly ground, in 8 fathoms. The marks for it are, the westernmost North Sunderland Sea-house, just open to the westward of Farn island, bearing S.  $\frac{3}{4}$  W. ; and Bamburgh barns in line with Hepburn hill.

Vessels on an emergency might anchor to the southward of Staples island, where, at the distance of 2 cables, they will find sandy ground in 12 fathoms. The square tower on Brownsman isle in line with its highest cliff, marks the eastern extremity of the clear ground ; and the same tower in line with the remains of the old lighthouse on Staples isle, marks its western limit.

**DIRECTIONS for Farn Islands.**—In approaching Holy island or the Staples from any direction seaward, the lead will be a sure guide ; for as long as a depth of 35 fathoms is maintained, that offing will be sufficient to carry a vessel two miles to the eastward of the Knavestone and Whirl rocks.

**CAUTION.**—At night, or in thick weather, do not attempt to pass in a less depth than 35 fathoms, on account of the character of the shoals and the varying indraught of the tide streams between the islands. A depth of 30 fathoms under such circumstances would be unsafe.

While proceeding through any of the channels by the leading marks, it would be prudent to check frequently the bearings by compass, in order to guard against fog or the drifting of buoys, a precaution particularly necessary in iron vessels.

**Outside Passage to the Southward.**—Having avoided the shoals in Berwick bay, by the directions given on page 24, and having

then kept out and advanced so far as to have Emmanuel head bearing W.  $\frac{3}{4}$  N., and therefore closing Holy island shoals, North Sunderland point must be brought open to the eastward of the Megstone ; if the wind be scant, keep the eastern Sea-houses at North Sunderland to the eastward of the Megstone, bearing S.  $\frac{1}{4}$  W. (view G.)\* ; or, if by night, keep Farn high light to the west of S.  $\frac{1}{2}$  W. After thus clearing the shoals off Holy island, the vessel should stand off to the depth of 35 fathoms, and not be hauled in again until Knavestone and Whirl rocks have been fairly passed, which will be when Farn high light bears N.W. by W.  $\frac{1}{4}$  W. If by day, and it be necessary to make a tack in-shore, the lighthouse must previously be brought on that bearing, or else bring Budle hill signal-staff open to the southward of Farn island, bearing W. by N.  $\frac{3}{4}$  N., which clears the Crumstone, Fang, and Bush.

**To the Northward.**—Having passed to the northward outside the Staples in 35 fathoms, or, if in clear weather, at a sufficient offing, and brought Longstone light to bear S.S.W.  $\frac{3}{4}$  W., Farn high light will appear well open to the westward of it, and a vessel bound to Berwick may then haul in until Longstone light bears S.S.E.  $\frac{1}{4}$  E., and proceed with it on that bearing until Berwick pier light bears N.W. by W.  $\frac{1}{2}$  W., when she will be in the fairway for the harbour.

**Inner Passage to the Southward.**—In approaching Goldstone channel from the northward, the signal-staff on Budle hill must not be opened to the westward of the beacon on Emmanuel head, in order to clear all the shoals in Berwick bay (view B.)\* ; and when the vessel arrives within one mile of Holy island, she should gradually edge outward in order to take up the proper mark for the channel. This mark is, Farn lighthouses over the centre of the Megstone, bearing S. by E.  $\frac{3}{4}$  E. (view E.)\*, they will lead in the fairway and close to westward of the Guzzard, in about 4 fathoms, which rocky shoal will have been passed when Kylvie church just opens to the southward of Old Law beacons W. by N.  $\frac{3}{4}$  N. The same track passes to eastward of, but very closely, the Tree-o'-the-House, after which the course is clear to the Megstone. The Megstone may be passed at the distance of about half a cable on its eastern side, or Farn high lighthouse brought less than its own height open to the eastward of the low lighthouse will lead through in mid-channel ; then pass round the western side of the Farn island at a cable's distance, and shape a course according to circumstances.

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The views referred to are on Sheet III, Farn islands to Berwick.

**By Night.**—In running for Goldstone channel from the northward by night, Farn high light should not be brought to the eastward of S. by E. or the low light opened till the vessel be nearly abreast Emmanuel head, by which time the low light ought to be visible ; if not, the channel must not be attempted. But when distinctly seen, bring it in line with the high light, and very exactly, for the two lights are so near each other that they would appear but little open, even at the sides of the channel. Having taken up this mark in good time, keep it on till Longstone light bears E. by S.  $\frac{3}{4}$  S., and then open the high light to the eastward of the low light, rather less than the apparent difference of their heights. This position of the lights will carry a vessel securely through Megstone channel, after which she may round the western side of the Farn and proceed to the southward, but with this caution that Farn light must be kept bearing N. by W.  $\frac{1}{4}$  W., or to the westward of it, in order to clear the foul ground off North Sunderland point.

**Inner Passage to the Northward.**—Passing North Sunderland point towards the Inner channel, the Grimstone, which lies one-quarter of a mile E.  $\frac{2}{3}$  N. from the Snook, will be avoided by keeping in a depth of at least 8 fathoms ; or the Megstone, just in sight to the westward of Farn island, bearing N. by W.  $\frac{1}{4}$  W. (view V.)\*, will lead well outside it. The Herring-house, open eastward of North Sunderland pier, bearing S.  $\frac{1}{2}$  W., clears the Outcars ; Monkhuse rocks are connected with the beach, and the Islestone is avoided by keeping Ross house, open to the northward of Black rocks point, bearing N.W. by W. (view T.),\* or a remarkable sharp peak of Kylloe hills in line with the same point.

**Megstone and Goldstone Channel.**—When Farn high lighthouse bears N. by W.  $\frac{1}{4}$  W., the vessel may be at once steered for it, and the island may be safely rounded at a cable's distance. Then open the high lighthouse to the east of the low lighthouse, rather less than the apparent difference of their heights, and keep them so till the Megstone has been passed on its eastern side at not less than half a cable ; when the lighthouses brought in line, bearing S. by E.  $\frac{1}{2}$  E. easterly, and directly over the Megstone (view E.),\* will lead just to the eastward of the Tree-o'-the-House, very little to the westward of the Guzzard, and through Goldstone channel. This passage between the Goldstone and Plough Seat should never be

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\* The views referred to are on Sheet III., Farn island to Berwick.

attempted unless the leading marks or lights be distinctly seen, for the soundings are irregular and the tidal streams are rapid.

**By Night.**—Vessels from the southward should not pass North Sunderland point during the night in a less depth than 12 fathoms, and for that purpose, Farn high light should not be brought farther to the northward than N. by W.  $\frac{1}{4}$  W. On that bearing a vessel may approach Farn island, whence a course must be shaped along its western side and round its north-west point at a cable's distance until the high light appears open to the eastward of the low light, rather less than their apparent difference in height, and kept in that position they will lead in mid-channel between the Elbow and the Megstone.

Having passed the Megstone, the lights on Farn island brought in line over the centre of the rock, bearing S. by E.  $\frac{3}{4}$  E., will lead between the Goldstone and Plough Seat till abreast Emmanuel head, when Farn high light must be brought S. by E., but not to the eastward of that bearing (when the low light becomes obscured seaward), in order to clear the shoals in Berwick bay.

**Junction with Outer Passage.**—As some vessels may find it convenient to take the outer passage, after having passed between the Megstone and Oxscar by the above directions, they should in such case continue with Farn lights in line till Longstone light bears E. by S.  $\frac{3}{4}$  S.; they may then haul out till Farn high light bears S.  $\frac{3}{4}$  W., on which bearing it will lead eastward of all the Holy island shoals. A safe mark for clearing these shoals in daylight is the Herring-house, near North Sunderland harbour, in line with the Megstone, bearing S.  $\frac{1}{3}$  W. (view G).

**DIRECTIONS for Inner Sound.**—Again, vessels from the southward not being able to fetch Megstone channel, or to distinguish the buoy of the Swadman, may pass through the Inner sound by keeping Farn high lighthouse S.E.  $\frac{1}{4}$  E. till Longstone lighthouse bears E.  $\frac{1}{2}$  S., or till Bamburgh castle bears S. by W.  $\frac{3}{4}$  W.; they will then have passed the Swadman, and may readily get far enough to windward to bring the Megstone and Farn lighthouses in line, as before directed. Or if, from other motives, they should then pass to the westward of the Swadman, and now wish, the wind being favourable, to gain the outer passage, they have only to run out N.E.  $\frac{3}{4}$  E., as soon as the Longstone bears E.  $\frac{1}{2}$  S., and bringing Farn high lighthouse S.  $\frac{3}{4}$  W., proceed to the northward with it on that bearing.

After passing the Megstone and the Oxscar, as soon as Longstone lighthouse bears E. by S.  $\frac{3}{4}$  S. haul out and pass to the eastward of the Guzzard and Stiel by bringing Farn high lighthouse to bear S.  $\frac{3}{4}$  W., and proceed to the northward with it on that bearing.

**West of the Swadman.**—If, having approached Farn island, it should be deemed advisable to pass to the westward of Swadman reef, that may be effected by bringing Farn high lighthouse to bear S.E.  $\frac{1}{4}$  E., and keeping it on that bearing till Longstone lighthouse bears E.  $\frac{1}{2}$  S., when a vessel may haul out to the eastward till Farn lighthouses are in line S. by E.  $\frac{3}{4}$  E., and so proceed through Goldstone channel, or haul out still farther to the eastward, till Farn high lighthouse bears S.  $\frac{3}{4}$  W., and then pass outside of the Stiel as before directed.

**DIRECTIONS for Skate Road.**—Skate road is so much exposed to the eastward, that it should only be used for anchorage during westerly winds, or when vessels can neither keep the sea nor enter Holy island harbour.

**From the Southward.**—In running for the inner passage from the southward, and so into Skate road, the Megstone should be kept touching the west side of Farn island, bearing N. by W.  $\frac{1}{4}$  W. (view V.)\*, or Farn high lighthouse kept N. by W.  $\frac{1}{4}$  W., till within a cable of the cliff, when the high lighthouse must be brought to bear S.E.  $\frac{1}{4}$  E., and kept on that bearing in order to clear the Swadman; and when Longstone light bears E. by S., anchorage will be found on a sandy bottom, in 6 fathoms; or, as the water shoals regularly towards the shore, vessels may feel their way by the lead farther to the northward, till Longstone lighthouse bears E. by S.  $\frac{3}{4}$  S., southerly, when Kyloe church will be seen through the Wide Open, bearing N.W. by W.  $\frac{1}{2}$  W. (view N.)\*, and Outchester tower is in line with Waren house, S.S.W.  $\frac{3}{4}$  W. (view M.)\*; in this position there is from 5 to 6 fathoms water, over sand.

**From the Northward.**—A vessel drawing 10 feet water, driven near Emmanuel head, and thereby forced to take the inner passage between the Plough and the island, may, if there is not sufficient water for her over the bar of Holy island harbour, proceed into Skate road by keeping the east end of Budle granary just open to the westward of Kettle Bottom hill, bearing S.  $\frac{3}{4}$  W., till Kyloe church is seen through the Wide Open, N.W. by W.  $\frac{1}{2}$  W. (view N.)\*, where she may anchor in 5 fathoms on a sandy bottom.

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The views referred to are on Sheet III., Farn islands to Berwick.



Vessels may sail through Goldstone channel into Skate road by keeping the north-west chimney of Waren house in line with Outchester tower, bearing S.S.W.  $\frac{3}{4}$  W. (view M.), till Kylvoe church is seen through the Wide Open, N.W. by W.  $\frac{1}{2}$  W., and Longstone lighthouse bears E. by S.  $\frac{3}{4}$  S.

**From the Eastward.**—Vessels that have cleared the Stiel and Guzzard, or when still farther to the eastward they have cleared Whirl rocks, Knavestone, and the north point of Longstone, may run into Skate road by edging away till Longstone lighthouse bears E. by S.  $\frac{3}{4}$  S., and proceed in with it on that bearing till Farn high lighthouse bears S.E.  $\frac{1}{4}$  S., when they may anchor.

Vessels drawing 10 feet water, and sailing from Skate road to Holy island harbour, should keep Kettle Bottom hill open to the east of Budle granary, bearing S.  $\frac{3}{4}$  W., in order to clear the Bat, till the beacons on Old Law come in line, W. by N., and then proceed in.

**DIRECTIONS for Staples Sound.**—Although Staples sound is one-third of a mile broad, the want of a distinct mark renders it an inconvenient passage, so that it is seldom used by vessels, unless they be compelled by a change of wind or other unforeseen circumstances to do so. If obliged to take it, special caution is necessary, not to steer for the *apparent* mid-channel between the Scarecrows and the Staples, for Bush and Knox reefs which show only at low-water, and the Islestone Shad with 9 feet over it, extend more than half way across this opening, but to keep towards the east side. The mid-channel depth varies from 9 to 13 fathoms, shoaling pretty regularly on the western side to 5 fathoms, and on the other side to 7 fathoms, which latter depth will be found close to Gun reef. The direct mid-channel course is N. by W.  $\frac{1}{4}$  W., and S. by E.  $\frac{1}{4}$  E., and the tide streams set generally in the same directions.

**From the Northward.**—If the vessel be coming from the northward and unable to weather the Whirls, she may proceed through Staples sound by giving a berth of 2 cables to the north-west point of the Wamses, and then steering so as to round Gun reef and Gun rock; the latter shows at two hours' ebb, when it is a useful guide in passing through this channel; if, however, it is not in sight, the vessel must feel her way by the lead. When hauling out to seaward after passing the Sound, give Fang rock to the south-west of the Crumstone a good berth.

**From the Southward.**—In coming from the southward, after passing the Crumstone, keep well over on the east side of the channel near Staples island, so as to avoid the projecting points of Knox reef, which extend more than half-way across from the Scarecrows towards that island. The Bush and Islestone Shad are also dangerous rocks bounding the channel to the westward, but neither of them projects as far as Knox reef. On the Staples side lies Gun rock, which, if dry, is the best guide for this passage ; otherwise, the vessel must, as before mentioned, feel her way by the lead. When Gun reef has been cleared, there will be no further obstruction in standing out to the northward between Glororum Shad and the Wamses ; and if obliged to borrow towards them, or towards Islestone Shad, the marks for each of these shoals will be found at page 35.

**From the Eastward.**—In running towards Staples sound from the eastward, care must be observed to avoid the Crumstone and the Fang ; then proceed as directed above. In a case of emergency, a safe passage will be found between the Callers and Staples island by keeping the large house at Glororum (on the main) in line with St. Cuthbert tower on Farn island, bearing W.  $\frac{2}{3}$  S. ; Bamburgh castle in line with the outer extremity of the Pinnacles of Staples island, which are steep, will also lead clear of the Callers in this cross channel ; and by night, Farn high light, bearing W. by S., will lead through clear of the Callers, and until the sound is open.

**TIDAL STREAMS.**—The tidal streams do not change at high and low water by the shore, but continues about  $2\frac{1}{2}$  hours after high and low water ; the south going is called the Flood stream and the north going the Ebb.

**Flood Stream.**—Off Goswick, the flood stream is increased in strength along the high sandy shore by the water forced in by the outlying reefs ; but when the extensive sand ridge becomes covered, this in-shore stream decreases in strength, for the flood stream through Holy island harbour, in advancing over Fenham flats, then meets the coast stream entering between the Snook and Beal point, which on springs happens about an hour and a half before high-water, or when the tide has risen 12 feet ; and the united streams, being thus deflected from the coast, may be said to form a circuit of Holy island for a short interval before high-water.

On approaching Emmanuel head, the stream, from meeting many obstructions, increases in strength. That portion of it which passes

inside the Plough, on reaching the bar turns in through Holy island harbour, and over Fenham flats. A middle portion takes the direction of Goldstone channel, and bends through Skate road ; in passing out between Bamburgh castle and Farn island it turns a little more to the eastward, and then pursues a S.S.E. course. Another portion takes the direction of Staples sound, where, owing to the contraction of the channel, it has a rate of 4 knots on springs, while the outer portion rushes over the Knavestone and Whirl rocks, causing turbulent rippings and eddies which all vessels will do well to avoid.

**Ebb Stream.**—In advancing from the southward, the ebb stream follows much the same course as the flood, but in an inverted order. Being intercepted by the chain of islets which lies directly at right angles with its course, it rushes through all the openings, especially Staples sound, and to the east of the Longstone, after which it unites with the outer main stream, and pursues its northerly direction, marking its course by strong rippings. Off the southern extremity of the Longstone, the rapidity of the ebb occasions a strong returning eddy.

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## CHAPTER II.

## NORTH SUNDERLAND TO TYNEMOUTH.

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Variation  $18^{\circ} 10'$  West in 1889.

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**NORTH SUNDERLAND POINT**, or the **SNOOK**, is a cliff about 30 feet high, having an extensive fore-shore of parallel ledges dipping to the southward.\*

**Grimstone**, a detached rock, drying 3 feet at low-water springs, but not uncovering at neaps, lies immediately off it, with the point bearing W.  $\frac{2}{3}$  S., and at 2 cables from the beach. It will be avoided by vessels hugging the land, or working up along shore, by keeping the west part of Greenhill farm, open to the north-eastward of Monkhouse, bearing N.W..



Greenhill farm open of Monkhouse, N.W.

**The Falls**, a continuation of the ledges which front the shore, extend about one-third of a mile in a S.E. by E.  $\frac{3}{4}$  E. direction from the Snook, having 12 feet upon their outer end, and 5 fathoms close outside.

**Buoy**.—A *red* conical buoy is placed in 6 fathoms at low-water, E. by N.  $\frac{1}{2}$  N. half a cable from the extremity of the Falls, with the Grimstone bearing N.W.  $\frac{3}{4}$  N., distant 2 cables ; North Sunderland church steeple, a little to the northward of North Sunderland point, W. by N.  $\frac{3}{4}$  N. ; Dunstanburgh castle, in line with Beadnel point, S.  $\frac{1}{2}$  W. ; Bamburgh castle, N.W. by N. ; and Farn high lighthouse, N.  $\frac{1}{4}$  W.

Before this buoy was established vessels bound to the northward in scant off-shore winds often got upon the Falls, deceived by the low ground to the southward of the Snook, and were it not that the rock shelves to the southward, such accidents would be attended with serious results.

When abreast the Falls, North Sunderland church is in line with the Snook. To clear the Falls and Grimstone passing to the north-

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\* See Admiralty chart of East coast of England, sheet VII., Hartlepool to St. Abb's head, with views, No. 1,192 ; scale, mile = 0.5 inch ; also plan of North Sunderland harbour, No. 1,632 ; scale, mile = 20.0 inches.

eastward, as well as the Car End near North Sunderland Sea-houses, keep the west part of Greenhill farm, open to the north-eastward of Monkhouse, bearing N.W., as previously mentioned. The ruins of Dunstanburgh castle kept open of Beadnel point, bearing S. by W., clears them passing to the eastward.

When in the neighbourhood of the Falls by night, keep outside the depth of 10 fathoms ; or do not bring Farn high light to the northward of N. by W.  $\frac{1}{4}$  W.

**The COAST.**—Red Brae is a dark-coloured, low, projecting cliff,  $1\frac{1}{4}$  mile to the southward of the Snook ; the coast between forms a deep bight fringed by sand-hills, the highest of which is about midway. The back ground rises to a moderate height a few miles inland, and the rounded mass of the Great Cheviot (2,669 feet) overtops all in the distance. The geological formation of the district from Berwick-on-Tweed to near Alnmouth is generally carboniferous limestone with coal ; intrusions of trap occur on the coast at Holy island, Bamburgh, Dunstanburgh, and Boulmer. The Cheviots are of porphyry.

**Beadnel Point**, half a mile beyond Red Brae, is low and of a wedge-like form, extending in an easterly direction ; the strata, like those at the Falls, dip abruptly to the southward. All the coast from the Snook to this point is foul for 3 cables off shore. The village of Beadnel, consisting of red-tiled houses, stands to the N.N.W., half a mile from the point ; the taper spire of its church, showing above the wood which bounds the village eastward, and westward, is a prominent object from the sea.

**BEADNEL HARBOUR.**—On the west side of Beadnel point is a large lime-kiln, with some red-tiled herring-houses near it. The harbour adjoins the lime-kiln on its west side ; it is very small, and formed by a north pier and a south one, with an elbow now in ruin, and causing an accumulation of sand in the harbour ; the bottom is freestone with 2 feet of silt over it, and the entrance is 57 feet wide. There are now only from 7 to 8 feet in it at high-water springs, but, being well protected by Beadnel point, there is little range except during south-easterly gales.\*

**Trade.**—The principal trade is in herrings and fishing stock. There is one branch pilot at Beadnel.

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\* In the Nautical Magazine of April, 1888, it is stated that some of the silt in this small harbour has been recently removed.

**Rockets** and lines are kept here for effecting communication with stranded vessels.

**BEADNEL BAY** extends from Beadnel point  $1\frac{1}{2}$  mile to Snook point, near Newton, off which is a projecting rocky ledge. Its shores are sandy and foul, several cars or ledges lying out some distance from the land.

**Dicky Shad** and **Newton Skere** are two rocky patches lying in the offing abreast Beadnel point. The depth over the former being 13 fathoms, with 15 to 20 fathoms around; from it Beadnel point bears W.  $\frac{1}{4}$  N., distant 2 miles. Newton Skere, with 12 fathoms upon it, and 25 to 30 fathoms around, lies with Beadnel point W. by N.  $\frac{1}{4}$  N.,  $4\frac{1}{4}$  miles. The sea breaks heavily upon both of them in easterly gales.

**Newton-by-the-Sea** is a village of red-tiled houses on the top of the bank between the Snook and Newton point; within the latter is a conical hill with the coast-guard watch-house and flagstaff on its summit, a very plain object from the sea.

**The Owlets**, with 7 feet upon them, are connected with the rocks on the south-west side of Newton point. Little Fills, with 9 feet upon it, lies adjacent. Fills is an extensive flat patch of rock, the highest part of which dries 9 feet. Emblestone, a massive ledge which only partially covers, forms the south breakwater to Newton haven. Out Car dries 12 feet, and lies a short distance to the southward of the Emblestone. Jenny Bells Car, within the Out Car, dries  $11\frac{1}{2}$  feet. There are several other patches, but none deserve particular notice. The clearing mark for all these rocks is, Boulmer trees, or Howick bathing-house, kept open to the eastward of Dunstanburgh point, bearing S. by W.  $\frac{1}{2}$  W.

**NEWTON ROCKS.**—Abreast the Snook and Newton point are several outlying dangers; the Ice Car, E.  $\frac{1}{4}$  S., one-quarter of a mile from Newton point, dries 4 feet; Snook ledge dries one-third of a mile out from the beach, with a few detached rocks about it; Whittingham Car, E. by N.  $\frac{3}{4}$  N., 4 cables from the Snook, dries 3 feet; the Faggot, N.E.  $\frac{1}{4}$  E., half a mile from Newton point, dries 2 feet; and it is also shoal a cable E. by S.  $\frac{3}{4}$  S. from it; the outermost danger is the Barnyard, with 7 feet upon it at low-water springs, N.E.  $\frac{1}{4}$  E., one-fifth of a mile from the Faggot.

**Buoy.**—A *red conical* buoy marks the outer extremity of these dangers; it lies in 7 fathoms at low-water, with Embleton church

over the south part of Newton point, bearing S.W.  $\frac{1}{2}$  W. westerly; and North Sunderland point, open of Beadnel point, N.  $\frac{3}{4}$  W. Should the buoy be out of place, the clearing marks for this cluster of dangers are, Bamburgh castle, kept open to the eastward of Beadnel point, bearing N.N.W.; and Boulmer trees, or Howick bathing-house, kept open to the eastward of Dunstanburgh point, bearing S. by W.  $\frac{1}{2}$  W.

**NEWTON HAVEN**, an opening between the rocks, is formed by Emblestone and Fills ledges to the southward and eastward, and by Newton point to the northward. It has from 11 to 12 feet in it at low-water, over a bottom of sand, but is exposed to a heavy sea in strong winds from N.N.E. to East. About 30 fishing boats belong to the place, and the fishing village Newton Sea-houses stands close to the shore. Directly above it, and to the westward of the watch-house, is a row of coast-guard buildings. A plentiful supply of good water is near at hand.

**Rockets**, &c., for saving life from wrecks are kept here.

**DIRECTIONS**.—In approaching Newton haven from the northward, keep Boulmer trees and Howick bathing-house open of Dunstanburgh point, bearing S. by W.  $\frac{1}{2}$  W., until Northstead farm (which stands on the outline, and N.  $\frac{3}{4}$  E. half a mile from the village of Embleton) comes over the north part of the first opening in the sand-hills to the southward of the Sea-houses, bearing W.  $\frac{1}{4}$  S. This gap may be easily known from its having a small cottage showing upon the south side of it, and when Dunstanburgh castle passes the large notch in the Emblestone, bring Northstead farm into the centre of the gap, and anchor in 11 or 12 feet, sand.

If from the southward, use the Dunstanburgh and Boulmer marks as above, until Snook point opens east of Newton point; keep them so, and when Northstead farm is upon the north side of the gap, proceed as before. In the case of a water-logged or disabled vessel, it is very possible to save life and property in Newton haven by a careful attention to these directions.

**EMBLETON BAY**.—The coast from Newton Sea-houses to Dunstanburgh point is composed of sand-hills, some of them of considerable elevation. The back ground rises quickly behind them, and on its crest is the village of Embleton, the tower of its church showing above the trees. Embleton bay is a good stopping-place in

off-shore winds, and is formed by the Out Car and Emblestone to the northward, and Dunstanburgh point to the southward. The anchorage marks are, Heifer-bank tower and trees in line with Dunstanstead, bearing W. by S.  $\frac{1}{2}$  S.; and Beadnel church spire, open to the eastward of Newton point, N.  $\frac{1}{4}$  W., in 6 to 8 fathoms, good holding-ground.



Dunstanburgh castle; North tower, S.W., 1 mile.

**DUNSTANBURGH CASTLE**, a fine old ruin, on the crest of a ridge of basaltic rocks which rise from the sea in ranges of black perpendicular pillars, is one of the most prominent objects upon the coast. It was built upon a layer of freestone overlying the basalt, and occupied an area of 9 acres, and is a noble relic of antiquity, probably of long standing, though not mentioned until the beginning of the fourteenth century. The portions of the castle now remaining are in detached masses, and from their resemblance are not inaptly termed by seamen the "Snags of Dunstanburgh." They consist of the south wall, with circular and square towers; the north tower, and a portion of the east wall. The north side of the point is a perpendicular cliff, but on the east and south sides the surface shelves gradually down to the sea, and here the main defences of the castle were placed. Close to the extremity of the point is a detached half-tide rock, which a berth of a cable will clear.

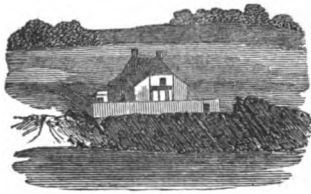
**CRASTER.**—From Dunstanburgh castle to Coolernose point, the coast is a sloping grassy bank, presenting the unusual feature of a cliff landward. In an opening about half-way along the bank is the village of Craster with its coast-guard station; on one point of bearing, Craster hall surrounded by wood shows through the gorge. The village is inhabited by fishermen, who derive some slight shelter for their cobbles in its little bay by the protection afforded by two half-tide ledges called the Great and Little Cars, which skirt the shore to the northward and southward; but on the first appearance of heavy weather the fishermen are forced to take their boats to the neighbouring havens of Newton or Boulmer. There is an excellent supply of fresh water below the village.



**Rocket** apparatus for effecting communication with stranded vessels is in charge of the coast-guard.

**Craster Skeres** is the name given to several rocky patches lying about 5 miles distant in the offing, with 12 to 14 fathoms upon them, and 20 to 30 fathoms around; in stormy weather, the break of the sea shows their position. From them Dunstanburgh Castle bears W. by N.  $\frac{3}{4}$  N. 5 miles.

The **COAST** from Coolernose point to Howick burn is rocky; in the foreground, Filshi craig (176 feet), Howick bathing-house and Sea-houses are prominent objects. In the background are Howick hall with its finely wooded domain, and the craig and tower of Ratcheugh (422 feet); trees, however, have now grown up so much about the latter object, that it is no longer readily discernible from sea.



Howick bathing-house. N.W.  $\frac{1}{4}$  mile.

From Howick burn southward, the coast is low and sandy. Red hill is inappropriately named, for it is scarcely above the general level. Thence to Waw burn the sand-hills continue without interruption, and are succeeded by a grassy bank, which attains a higher elevation in Alnmouth Heugh or Beacon hill. The most prominent objects are the village of Boulmer with a clump of trees at its west end, and a coast-guard flag-staff and a life-boat house a short distance to the southward; then the farm of Seaton, within Seaton point; and Foxton hall, with extensive outbuildings, and Marden, a small farmhouse, both on the bank top between Seaton point and Alnmouth Heugh. Beacon Hill was the site of a very ancient camp, which also takes in Marden farm.

In this district the coast is fringed with projecting ledges and outlying dangers, extending in some places three-quarters of a mile from the land; and as the low character of the shore abreast adds to the evil, Boulmer, and its immediate vicinity, is considered the most dangerous portion of this coast, and witnesses an annual loss of life and property, due in too many instances to a reckless disregard of the proper marks for avoiding the dangers.

**BOULMER BUSH, BOULMER STILE, &c.**—Houghton Stile and Red End Stile lie north and south, close off Red hill point; and Boulmer Bush, a rock with  $7\frac{1}{2}$  feet upon it, lies abreast the village

of Boulmer. Boulmer Stile, with 12 feet upon it, is half a mile to the south-east of Seaton point.

**Buoy.**—A *red conical* buoy lies to the southward of Boulmer Stile, in 5 fathoms at low-water; with Spylaw trees (346 feet), upon an eminence on the south side of the vale of the Aln, over Marden farm, bearing W.  $\frac{3}{4}$  N.; Warkworth castle, open three times its breadth to the southward of Birling Car rocks, S.W.  $\frac{1}{2}$  W.; Coquet lighthouse, S. by W.  $\frac{1}{4}$  W.; and Ratcheugh tower, N.W.

The clearing marks for the dangers in the vicinity of Boulmer, are Newton watch-house, seen open of the first brow within Dunstanburgh castle, bearing N.  $\frac{1}{4}$  W.; or Cresswell hall, open to the eastward of Hauxley point, S. by W.  $\frac{3}{4}$  W., (*see* view B. on chart No. 1,192,) which clears them all passing to the eastward. Spylaw trees, kept well open to the left of Marden farm, bearing W. by N., clears Boulmer Stile on its south side.

**ALNMOUTH ROCKS**, uncovering at half-tide, lie under Marden farm, and two shoal patches are also abreast the latter; one, Seaton Shad, with 27 feet; and the other, a short distance to the north-east, with 21 feet upon it at low-water.

Alnmouth rocks, are more in the way of vessels working into and out of Alnmouth bay than of vessels bound up the coast; to clear them keep Warkworth castle, open to the south-eastward of Birling Car point, bearing S.W.

By night, keep Coquet *white* light in sight, and not to the southward of S. by W.  $\frac{1}{4}$  W., when its colour changes from white to *red*; this leads outside all dangers north of Alnmouth; another good mark to clear Boulmer Bush, Stile, &c. is, Farn light, kept in sight outside Dunstanburgh castle, bearing N.  $\frac{1}{4}$  E.; but care must be observed that Longstone light is not taken for it. In misty weather, when the lights are not visible, keep outside the depth of 20 fathoms while abreast Boulmer.

**Boulmer Haven** is in reality a boat haven, though many vessels have saved themselves here; it is a clear and rather extensive space within the trap rocks fronting Boulmer, with an entrance through them termed the Marrmouth. The depth in the haven at low-water varies from 4 to 8 feet. The Marrmouth is 120 feet wide, with 7 feet in it at low-water; two *white* beacons with triangular heads lead through it when kept in line, and the anchor should be let go when

Warkworth castle touches Seaton point. The water is smooth inside, and vessels takes no harm, as they lie on a bottom of clean sand.

**A Life-Boat** is placed here. Boulmer is also a rocket station.

**ALNMOUTH BAY**, extending from Seaton point to Coquet island, is 4 miles long and  $1\frac{1}{2}$  mile deep. Vessels bound southward usually work into it to escape the weight of the ebb, and *vice versâ*; but both in entering or quitting it, careful attention should be paid to the marks for clearing Alnmouth rocks and Boulmer Stile. Vessels waiting tide to enter Alnmouth, anchor in the north part of the bay, with Spylaw trees, open a little to the northward of Church hill, bearing N.W. by W.  $\frac{1}{4}$  W.; and Warkworth castle and Birling Car point in line, S.W.  $\frac{1}{4}$  S.; in 3 fathoms, sand.

The **COAST** from the river Aln to the river Coquet, is composed of sand-hills, the only interruption being Birling Car point, a rocky cliff 67 feet high, and a ledge extending from this point is the only foul ground upon the western shore of Alnmouth bay. A narrow band of millstone grit occurs between the limestone to the north and the coal measures to the south, which extend near to Tynemouth. From Spylaw, the back-ground gradually declines in height as it approaches the Coquet, and the surface is prettily divided by hedge trees; the most prominent objects are the farms of high Buston and Northfield, and the flat-topped plantation upon Shilbottle hill (573 feet), a little farther inland. Some new growths have sprung up on the north side of the old plantation and doubled its breadth; it is the southern and highest part which is referred to in the directions.

**Fluke Bay**, a small opening between Alnmouth rocks and the ledges off Seaton point, is used by the coasters as an anchorage in northerly winds; the marks for it are Spylaw trees, over Marden farm, bearing W.  $\frac{3}{4}$  N.; and Ratcheugh tower, over the east brow of Waw burn, N.W.  $\frac{3}{4}$  N.; in 3 to 4 fathoms, sand.

**ALNMOUTH** stands on the north side of the outlet of the river Aln, and at the foot of an eminence called Alnmouth Heugh. The principal buildings in the town are some lofty granaries, which stand in front of it on the sea side, and a chapel with a belfry near the coast-guard station on the point. A conspicuous barometric indicator has been placed by the Duke of Northumberland on the sea gable of the coast-guard houses. Population in 1881 was 541. There is a postal telegraph office here.

Church hill (the site of a chapel and burial ground), though formerly joined to Alnmouth, is now an island, the river separating it from the town. A great part of it has been washed away by the tide.

**The RIVER ALN** is subject to very heavy freshes in the winter season ; there is also a considerable range into it when the sea does not break outside ; but when it breaks, the range is less. In northerly gales a partial protection is afforded the entrance by the foul ground off Boulmer ; E.S.E. gales send home the heaviest sea, but even then the Aln is not considered so dangerous as some neighbouring bars. There is a ford across the Aln passable at low-water ; it is an artificial bank of large stones raised about 2 feet above the bed of the stream ; it forms a dangerous and illegal obstruction in the harbour, and has been the cause of damage to vessels. The tide flows up to Lesbury, 3 miles above, and the river is navigable so far for large boats.

**Harbour.**—The lower reach of the river constitutes the harbour ; the bottom is stiff clay with a coating of sand ; there are from 11 to 12 feet in it and over the bar at high-water springs, but vessels lie aground at low-water.

The channel, marked on each side by warping posts, is always best after a fresh, but as its width, as well as the position of the bar at the entrance, varies with every disturbing cause, no marks worthy of dependence can be given ; the pilots, however, frequently examine the channel, mark it by small iron buoys, and are prompt in boarding vessels when required. There are no tide lights, except those the pilots exhibit for their own use.

**Pilots.**—There are two licensed pilots.

Alnmouth possesses many advantages as a watering-place, and Bilton station on the North-Eastern railway is at a convenient distance from it.

About eight vessels of various sizes belong to the place, which is a Creek of Shields Custom-house. The trade consists principally of imports of wood from America and the Baltic, slates from Wales, general cargoes from London, and patent and other manures ; besides a small share in the herring fishery. A Vice-Consul is resident at Alnwick for Sweden and Norway. There is good spring water at hand ; other supplies can be obtained, but there is no coal kept in stock, or facilities for coaling a steamer.

A **Life-Boat** is on the shore a short distance to the north-east of the village ; and a supply of rockets and lines is kept at the coast-guard station, in case of shipwreck.



Coquet island.—Lighthouse, N. by W.,  $\frac{1}{4}$  mile.

**COQUET ISLAND**, two-thirds of a mile from the main land, and about 16 acres in extent, is elevated 35 feet above high water. It extends in a N.N.E. and S.S.W. direction, 400 yards in length by 200 yards in breadth, but at low-water ledges dry out from it, which more than double its size.\* It is the property of the Duke of Northumberland.

**LIGHTS.**—The tower of the old castle on the south-western side of Coquet island, was, by the permission of the noble proprietor, adapted as a lighthouse by the Trinity Board of London, in the year 1841. The light is a *fixed* dioptric light of the first order, and shows *white* when seen from the eastward between the bearings S. by W.  $\frac{1}{4}$  W. and N.  $\frac{1}{2}$  E. ; and *red* from S. by W.  $\frac{1}{4}$  W. into the land to cover Boulmer Bush and Boulmer Stile rocks. It is elevated 83 feet above high-water, and is visible 14 miles in clear weather. A *dim* light is seen round the remainder of the circle, in towards the shore.

A second *fixed* light, 28 feet below the above light, and in the same tower, shows *white* between the bearings N.N.W.  $\frac{1}{4}$  W. (2 cables outside Hauxley point buoy) and N. by W., and *red* between N. by W. and N. by E.  $\frac{1}{4}$  E. over Bondicar Bush shoal ; the change from *white* to *red* is in the line of the Hauxley buoy. As long as the *bright* part of the upper light is in sight, vessels will be outside the shoal ground off Newbiggin, and in Druridge bay, on the south side of Coquet island ; and outside the shoal ground off Alnmouth, and Boulmer to the northward of Coquet island. When within 3 miles of the island, the lower *red* light should be kept shut in. It is contemplated altering the character of this light from *fixed* to *intermittent*.

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\* See Admiralty plan of Coquet road and channel, No. 1,721 ; scale, mile = 12·6 inches.

The **DANGERS** to the northward and westward of **COQUET ISLAND** are marked by the following buoys, which have their names painted on them.

**N.E. Coquet**, a spherical buoy, *striped horizontally red and white*, with staff and diamond, in  $8\frac{1}{2}$  fathoms depth at low-water marks the North Stile, which is the danger off the north-eastern extremity of the island. It lies with Morwick trees, open their own breadth north of Pan point, bearing W.  $\frac{1}{4}$  N. ; Cresswell hall, open a little to the eastward of the grassy part of Coquet island, S.S.W. westerly ; and Coquet lighthouse, S.W. by S. distant rather more than half a mile.

**N.W. Coquet**, *red and white chequered* can, lies in 12 feet at low-water, at the north-west extremity of the foul ground ; with a clump of trees inland of Cresswell, shut in upon Bondicar point ; Morwick trees, their own breadth south of Glo'ster hill farm ; and Coquet lighthouse, S.  $\frac{3}{4}$  E.

**Pan Bush**, a *red* conical buoy, in  $3\frac{1}{2}$  fathoms at low-water, lies upon the east side of the Pan Bush, a rocky shoal with as little as 3 feet upon it, abreast of and half a mile from the entrance to Warkworth harbour, and bounding the north channel to Coquet road to the westward ; with Radcliff colliery chimney, in line with Amble Link house, bearing S.W.  $\frac{1}{3}$  S. ; and Spylaw trees, open a little to the eastward of Birling Car point, N.N.W.  $\frac{1}{2}$  W.

**S.W. Coquet**, a can buoy, *striped vertically red and white*, in 18 feet at low-water, marks the south-western extremity of the foul ground on the east side of Coquet or South channel ; its marks are, the east end of Shilbottle trees, over the tower of Warkworth castle, bearing N.W.  $\frac{1}{2}$  W. ; and the east chimney of Hauxley Link house opening from behind Hauxley point, S.W.  $\frac{1}{4}$  S.

**Sand Spit**, a *red* conical buoy, in 9 feet at low-water, off the extremity of the rocks which continue in a north-easterly direction from Hauxley point, mark with Hauxley buoy, the west side of Coquet or South channel. It lies with Warkworth castle, in line with Pan point, bearing N.W.  $\frac{1}{2}$  W. ; and Bondicar house, just showing to the eastward of Hauxley point, S.W. by S. ; Hauxley buoy, S.S.E.  $\frac{1}{2}$  E. ; N.W. Coquet buoy, N.N.E.  $\frac{1}{4}$  E. ; and Pan Bush buoy, N.  $\frac{3}{4}$  W.

**Hauxley head and Bondicar Bush.**—The mainland south of Coquet island is fronted by ledges and detached rocks extending off three-quarters of a mile ; each ledge has a name, but the extreme

dangers are Bondicar Bush, and Hauxley head ; the former, on which many vessels have been lost, is an outlying rock abreast Bondicar point, with 6 feet upon it, and 7 fathoms close outside it, and must be carefully avoided by giving the shore a berth of one mile at least.

**Buoy.**—A *red* conical buoy lies in 8 fathoms at low-water, one cable east of Bondicar bush ; with Brairdon hill over Bondicar house W. by N.  $\frac{3}{4}$  N. ; Spy-law hill over Amble pier-head N.N.W. ; Coquet lighthouse bearing N.  $\frac{1}{4}$  E. ; and Hauxley buoy, N. by E.  $\frac{1}{2}$  E.

**Off Hauxley head** there is also a *red* conical buoy, with staff and globe, lying in 9 fathoms at low-water, 2 cables outside a steep rocky ledge which dries. It is placed with Earsdon windmill, in line with Bondicar point, bearing W. by S.  $\frac{3}{4}$  S. ; Warkworth castle tower, over the rocks of Well Heugh point, N.W. northerly ; and Coquet lighthouse, N. by W. As before remarked, Coquet lower light changes from *white* to *red* in the direction of this buoy.

**COQUET ROAD** is bounded by the island ledges, Law Briggs, Hauxley sands, and the Pan Bush ; the roadstead thus formed is secure from east, round southerly, to N.W. ; with the wind from any other quarter it is exposed, and should not be used except under extreme circumstances. For the best anchorage the marks are, Warkworth castle, appearing midway between the pier-heads, bearing N.W.  $\frac{1}{2}$  W. ; and Cresswell hall, Bondicar, and Hauxley points in line, S. by W.  $\frac{3}{4}$  W. ; in 18 to 22 feet, sand.

**DIRECTIONS.**—The North channel into Coquet road is between the island ledges to the eastward, and the Pan Bush to the westward, a general breadth of one-third of a mile. If closing from the northward, keep Coquet lighthouse bearing S.  $\frac{1}{4}$  E., and when Morwick trees (a small plantation standing on high ground, to the south-westward or Warkworth) are open their own breadth to the northward of Pan point, bearing W.  $\frac{1}{4}$  N. ; a S.W.  $\frac{1}{4}$  S. course will lead to the anchorage in Coquet road. Morwick trees must not be mistaken for another clump to the southward of them ; the latter stands upon lower ground, but is the more distinct of the two.

If from the southward, pass to the eastward of Coquet island, giving it a berth of 3 cables, and do not shut Bondicar point behind the high-water mark of the island, until Morwick trees are open their own breadth to the northward of Pan point, bearing W.  $\frac{1}{4}$  N. This latter mark clears the North Stile, and when Coquet lighthouse bears S.  $\frac{1}{4}$  E., a S.W.  $\frac{1}{4}$  S. course leads to the anchorage as before.

Working in or out of this channel, stand towards the Pan Bush till the western portion of Hauxley trees is open its own breadth to the eastward of Tawnaway hill (the highest sand-hill between Pan and Hauxley points), bearing S.W. by S. ; and towards the island to the distance of 2 cables, keeping the lead going under all circumstances. Care must be observed while near the North Stile, as the flood sets strongly across it to the south-eastward.

If bound to Warkworth harbour from Coquet road, keep the western portion of Hauxley trees open its own breadth to the eastward of Tawnaway hill, bearing S.W. by S., until the first clump of wood to the southward of Morwick trees is over the inner end of the north breakwater at Warkworth harbour, W.  $\frac{1}{4}$  S. This mark leads to the northward of the Pan Bush, in 4 fathoms at low-water, and when the same division of Hauxley trees is seen to the westward of Tawnaway hill, bearing S. by W.  $\frac{3}{4}$  W., the entrance to the harbour will lie on the best bearing for closing.

**Coquet or South Channel** into Coquet road has the foul ground from the island to the eastward, and Hauxley rocks to the westward, and being less than one cable in width, with only 8 feet over a bottom of rock, should never be used except with a leading wind, and depth to spare, allowing for the lift of the sea. The marks for it are as follows—while closing from the southward, to clear Bondicar Bush and Hauxley head, keep Dunstanburgh castle open to the eastward of Coquet island, about the breadth of the grassy part of the island, bearing N.  $\frac{1}{4}$  E. (*see* view A. on chart No. 1,192), until the tower of Warkworth castle is in line with the house upon Pan point, bearing N.W.  $\frac{1}{2}$  W. ; keep this mark on until Hauxley link-house (red tiles) is observed shutting in behind Hauxley point, S.W. ; Ratcheugh tower will then appear over Alnmouth Heugh, bearing N. by W.  $\frac{1}{4}$  W. This latter mark leads through Coquet channel in the best water, leaving the S.W. Coquet buoy on the starboard hand, and the Spit buoy on the port hand ; and when Shilbottle trees are open their own breadth to the northward of Warkworth castle, bearing N.W.  $\frac{1}{2}$  W., steer in for the anchorage in Coquet road.

**TIDES.**—It is high water, full and change, at 3h. ; springs rise  $14\frac{1}{2}$  feet, neaps 11 feet, and neaps range  $7\frac{1}{2}$  feet. The tidal streams do not change at high and low water by the shore. In Coquet road the south-going stream runs from one to one and a half hours after high water at springs, and for about three-quarters of an hour after neaps ; whilst



the north-going stream changes at low water. At about one to one and a half miles off Coquet island the south-going stream runs for two hours after high water on the shore, and the north-going stream two hours after low-water ; whilst three to four miles off the true stream is felt, which changes at about three hours after high and low water, or at about the times of high and low water at Hull. The changes of the stream are accelerated or delayed by the wind if of any force. The stream of tide sets fairly through Coquet road and the South channel until half-flood, but more southerly as Hauxley and Bondicar rocks cover. The ebb sets fair, but with less strength than the flood. As before observed, the flood stream sets strongly to the south-eastward across the North Stile.

**Caution.**—The tidal stream close in shore from North Sunderland to Tynemouth follows the direction of the coast, turning round the points and into the bays ; consequently when proceeding against the stream it is necessary to be very cautious, especially in foggy weather, and on no account neglect the lead. A depth of 20 fathoms will keep a vessel a fair distance off the shore on this section of the coast.

By neglecting the lead in thick weather several valuable steamers have been lost in the neighbourhood of Coquet island.

**RIVER COQUET** takes its rise in the western part of the county of Northumberland, and after a course of 37 miles through a hilly country and betwixt steep banks, has its outlet in the south-west corner of Alnmouth bay, washing the north side of Amble or Pan point. During the rainy season the Coquet is subject to heavy floods, but at other times its volume below the town of Warkworth is inconsiderable.

**Warkworth Castle.**—The town of Warkworth stands on the right bank of the Coquet  $1\frac{1}{2}$  miles above its outlet, a bend of the river nearly surrounding it. Very little of the town is visible from the sea, but the ruin of its noble castle, standing on an eminence directly above it, is a prominent object from every point of view, and very useful as a sea-mark. It was anciently a stronghold of the Percys, and parts of it in good preservation have been restored, but the date of its erection is unknown. It has an octagonal keep and projecting towers, and the summit of a small exploratory tower, which rises from the centre of the keep, is 172 feet above high water. The outer walls extend to the southward, and enclose a considerable area ; where entire they are 36 feet in height.

**WARKWORTH HARBOUR**, formed by the lower reach of the river, remained in its natural state till 1839, when a company obtained an Act for its improvement. The works then begun have been carried on from time to time, but the promoters have had to contend with the natural difficulties of a small river in the dry season, a short and insufficient tidal reservoir, the tide only flowing up it one mile above the town of Warkworth, and the large tract of sand at and about its entrance. In addition to several rubblestone jetties for turning the course of the river, the works consist of north and south breakwater piers ; the former is a massive structure built of freestone and green whinstone, and extends 700 yards E.S.E. from the shore ; the latter starts from the base of the Pan hill in a northerly direction, and is constructed of rough stone and concrete ; it is 200 yards long. The entrance between them is 225 feet wide, facing E.S.E. ; the bottom within and without is sea-sand, in places mixed with silt, and farther up with gravel. In the harbour, which is about 18 acres in extent, the depth of water has been increased by dredging operations to 10 feet at low water springs. Training walls from Helsay point to Amble are also being constructed.

**Supplies.**—Coals are readily obtained from the neighbouring collieries, and are shipped at the coal shoots in the harbour, alongside which the depth at low water is 10 feet ; other supplies are plentiful.

**LIGHT.**—A lighthouse stands upon the outer extremity of the south pier, whence a *fixed* light is exhibited at night when there is a depth of 10 feet on the bar ; the light, which is elevated 35 feet above high-water, and should be visible in clear weather at the distance of 5 miles, is *white* southward of the bearing W. by N.  $\frac{1}{4}$  N., and *red* northward of that bearing. When the sea is too high to allow vessels to enter the light will not be shown.

A black ball is exhibited by day from above the inner end of the south pier when there is 10 feet water at the entrance.

A beacon is also placed on the north pier-head.

There is a considerable range into the harbour at times, and, as before observed, the river is subject to heavy freshes ; the worst sea at the entrance is in north-east gales, when nearly the whole of the space from the river to Coquet island is broken water.

In 1886, 704 vessels entered the port, of an aggregate tonnage of 158,845 tons. The trade is confined to the export of coal, bricks, and

building stone. A branch of the North-Eastern railway is brought down to the harbour. Population of Amble in 1881 was 1,888.

Steam-tugs and pilots are always in attendance on vessels entering or leaving the harbour.

**Bar.**—The bar, which formerly had only one foot depth on it at low-water, and  $15\frac{1}{2}$  feet at high water springs, and, beginning at the end of the north breakwater, extended in a horseshoe form, 200 yards outside the entrance, and joined Pan rocks to the southward, has been somewhat reduced by dredging ; and, by the same means, the entrance, as well as the channel of the harbour, has been improved in depth, vessels laden up to  $16\frac{1}{4}$  feet having during the year 1880 sailed from the port.\*

As the bar is subject to change, no marks worthy of dependence can be given, but, when practicable, vessels will be boarded by one of the resident pilots. Still, during heavy weather, and when a pilot cannot be obtained, and supposing a vessel to have cleared the dangers already described in the approach, the best plan is to close the harbour on a W.S.W. (southerly) bearing and enter between the lighthouse and the beacon which mark the pier-heads ; the channel within is then confined to the concave side of the rubblestone jetty up to Radcliff staiths, one-third of a mile within the entrance, where vessels can load.

**Rocket** apparatus is placed at Amble.

**HAUXLEY.**—From Pan point to Bondicar point, the coast is sandy and low ; the village of Hauxley, a short distance within Hauxley point, has a good deal of wood about it, which shows in two distinct divisions on some points of bearing. Radcliff colliery (useful as a clearing mark) stands half a mile to the westward of the village, and may be easily known. Hauxley is entirely inhabited by fishermen, who have 21 boats, which they stow in a small opening between the rocks, called Hauxley haven.

**A Life-Boat** is stationed here, and also rocket apparatus.

**The DANGERS** abreast this section of coast, and the day mark to avoid them, have already been described on pages 55 to 57. In thick weather, go no nearer than 20 fathoms ; and at night do not bring Coquet light to the northward of N. by W.  $\frac{1}{4}$  W. when within 3 miles of it.

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\* From a printed report of Messrs. Thomas Meik & Son, Civil Engineers, Engineers to the Warkworth Harbour Commissioners, August, 1880.

**DRURIDGE BAY**, extending from Bondicar to Cresswell, is 5 miles long by one mile deep ; the shore is low and sandy, and the background moderately high. The old castle of Widdrington, surrounded by wood, stands one mile back from the coast, and the peaks of Shaftham (1,003 feet), and Bradham (940 feet), with their steep northern faces, bound the view inland. In the south part of the bay, Cresswell point, low and rocky, the Sea-houses upon it, and the large modern mansion, Cresswell hall, in the midst of trees, a short distance within it, are all prominent objects. Here curious specimens of gigantic fossil cacti or reeds are frequently found ; they grew in a sandstone of clay shale of the coal formation.

A usual anchorage in Druridge bay is about the centre, one mile east of Chibburn mouth, in 5 or 6 fathoms.

**A Life-Boat** is stationed at Cresswell.

**Northern Hill and White Bank.**—The centre of Druridge bay is clean, but in the north part of it are two rocky patches, the Northern Hill and White bank, with 13 feet upon them, and 5 to 6 fathoms around them, lying one mile to the southward of Bondicar point ; there are also two foul projections from the shore abreast, named Carstone and Hadstone skere.

**Cresswell Skeres**, two rocky patches with 3 fathoms upon them, and 12 fathoms close outside them, are off the south part of the bay, more than one mile from the shore.

The mark for clearing all the shoals about Druridge bay, passing to the eastward, is Ratcheugh tower, open to the eastward of Hauxley point, bearing N.  $\frac{3}{4}$  W., until Cresswell hall bears W.  $\frac{1}{4}$  N. At night-time do not lose sight of the *bright* part of the upper Coquet light.

Ratcheugh tower, kept to the eastward of Radcliff colliery, bearing N.  $\frac{1}{4}$  W., clears all the foul ground abreast Cresswell and Newbiggin points, as the Broad Car, Wares, Bridge, Seal Car, and Black Dyke, Out Car, and Ness, which extend outwards fully half a mile.

**The COAST** from Snab point to Paul point is low and sandy. Lynmouth, a high sand-hill on the south side of Lyn burn, stands half-way between them. Between Paul and Newbiggin points ledges extend from the shore outside, which are two shoal patches named Black Dyke and Ness. The clearing mark in the daytime is Ratcheugh tower kept east of Radcliff colliery, N.  $\frac{1}{4}$  W. At night-time do not lose sight of the *bright* part of upper Coquet light. In thick weather keep outside the depth of 20 fathoms.

**Newbiggin Point**, 20 feet above high-water, is based upon projecting ledges. Newbiggin church stands a short distance within and from its advanced position is always remarkable, whether approached from the northward or southward ; it consists of a tower and spire, a nave, and a much admired chancel. The village of Newbiggin, to the westward of the point, and upon the margin of the bay, is chiefly inhabited by fishermen, who have 63 boats here ; there are also houses for the accommodation of sea-bathers, with whom it is a favourite resort.

**LIGHT.**—A *fixed* light, *red* to seaward, and *green* from the bearing S.W. by W. into Newbiggin bay, is shown during the herring season.

A **Telegraph cable** extends between Newbiggin and Sondervig in Denmark.

Woodhorn windmill and church, and the mansion called the Demesne, are all prominent upon the high back-ground to the north-west of the village. There is very good shelter in Newbiggin bay with northerly winds, bottom, sand over clay ; and its shore continues sandy, with sloping grass banks, to Spittal burn, where rock begins.

A **Life-Boat** is stationed at Newbiggin ; there are also rockets and lines for effecting communication with stranded vessels.

**North Seaton** village, a long mile to the westward of Newbiggin, stands high, and, being surrounded by wood, very little of it is visible from the sea ; North Seaton colliery is a short distance to the south-west. The shore abreast is rocky, and the Horse Bridge, a curious collection of boulder stones, stretches out nearly half a mile from the main. While working abreast, do not go nearer than 5 fathoms.

**WANSBECK.**—This river has a course of 24 miles ; the entrance is narrow and obstructed by sand, but immediately within the breadth increases. The pilots have several beacons for leading in, which they shift as alterations occur. The northern side of the channel is bounded by a low training-wall of rubble, and there are two small quays on the south and one on the north side for the shipment of freestone from the neighbouring quarries, but this export has greatly fallen off. The coals from North Seaton colliery were shipped from a staith on the north side of the Wansbeck, half a mile above Camboise, and about 50 or 60 vessels entered for the purpose annually, but no shipments have been made now for some years. Camboise is a village on the south side of the mouth of the river, having good spring water near it.

From Camboise to Blyth the coast is low and sandy, and several windmills and colliery chimneys are visible behind it.

**A Life-Boat** is placed a short distance to the Southward of the Row Cars between Camboise and Blyth. There is also a rocket apparatus.

**BLYTH\*** stands on the south-west side of the river Blyth at its outlet. It is a place of some antiquity. Coals were first shipped here upwards of two hundred years ago, but the size of the town continued small till the close of the last century, when the opening of Cowpen colliery in its immediate neighbourhood caused an improvement in its trade and appearance.

There are no remarkable buildings visible from the sea, and the belfry of its church is scarcely seen above the roofs of the houses.

**LIGHTS.**—The principal objects are the two lighthouses at the south end of the town; they bear N. by W.  $\frac{3}{4}$  W. and S. by E.  $\frac{3}{4}$  E. 200 yards from each other, and exhibit *fixed white* lights, respectively, 63 and 28 feet above high water, only shown when the tide is 6 feet above the level of low water ordinary springs; the high light is visible 15 miles, and the low light 7 miles, in clear weather. By day a *blue* flag is hoisted upon the high lighthouse at tide-time to indicate the same depth of water. A *fixed white* light is also shown from a wooden lighthouse upon the end of the east pier, elevated 30 feet above high water, and a *fixed red* light from a small iron lighthouse on the west pier end elevated 28 feet above high water.

Two *fixed white* lights are also exhibited from small wood lighthouses erected on Blyth Snook, which when in line bearing N.  $\frac{1}{8}$  E., lead through the inner part of the channel into Blyth harbour. A small *green light* is also shown from a beacon on the east side of the channel, at the point where a vessel's course has to be altered in entering the harbour.

**Link Beacons.**—There are two beacons with black diamond heads upon the sand-hills to the southward of the town for leading clear of Seaton Bush and all outlying rocks, when in line they bear West.

**Two Life-Boats** are stationed at Blyth; one near the high lighthouse, and the other on the north side of the harbour: rockets and lines are kept here in case of wreck.

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\* See Admiralty plan of Blyth, No. 1,626; scale, mile = 12 inches.

**BLYTH ROCKS.**—Abreast, and to the southward of Blyth, are some extensive ledges and detached rocks, above and below water, the outermost being three-quarters of a mile from the main. Of the former character are the Row Cars, Crablaw rocks, Sow and Pigs (marked by a beacon at their eastern extremity), and Seaton Sea rocks; the last two are the southernmost, and farthest out. Of the latter description, are the North and South spits, with 12 and 14 feet, and the Knot and Seaton Bush with 11 feet over them. All these dangers will be cleared either in going to the northward or southward, by keeping the buildings of Tynemouth castle open their own breadth outside Hartley Bates, bearing S.  $\frac{1}{2}$  W. (See view C. on chart, sheet vii., No. 1,192.)

**The RIVER BLYTH** has a tortuous course of 37 miles; the lower portion of it towards the outlet constituting the harbour of Blyth the area of which is about 40 acres; after passing the town, the river is conducted between breakwaters along the inner face of Blyth rocks in a direction nearly parallel to the shore, and finally joins the sea half a mile to the southward of the town.

**Piers.**—The piers, originally undertaken in 1855 by the Blyth Harbour and Dock Company for the improvement of the entrance to Blyth, consist of a double curved pier, or breakwater, 4,468 feet long, on the eastern side, the inner 1,800 feet of which is of stone, and the outer portion of 2,668 feet of timber framing filled with loose stones. It has recently been extended 300 feet farther to the southward by a concrete pier with a timber super-structure. Upon the opposite, or western side, of the entrance, is a new West pier, of timber piling with a rubble heart, extending from the shore just above Blyth links in an E.S.E. direction for 300 yards, and then in a S.S.E. direction for another 500 yards. At the ends of the piers are small lighthouses.

The channel between the piers has been dredged to a depth of 12 feet at low-water, but it is very narrow (about 120 feet wide at the bottom), and is over towards the west breakwater, the centre of the channel being 150 feet from that breakwater; above the town the river opens out into a wide expanse, and forms a considerable reservoir. The tidal flow ceases at the dam of Bedlington iron works, 3 miles above Blyth. When the last Admiralty survey of the port was made, in 1866, the bar had half a foot upon it at low-water of spring tides, and the depth in the channel varied from 2 to 4 feet

up to the quays of the town ; but since then dredging has been steadily prosecuted, new loading berths have been formed on the north-east side of the harbour, the channel has been cleared of all obstructions, and the depth into the harbour is now 12 feet at low-water, with a space of 15 to 18 feet abreast the town.

**Buoys and beacons.**—Upon the east side of the entrance channel between the piers, two small buoys and five beacons have been placed on an old barrier of hard ground.

**Docks, &c.**—Blyth is faced on its north-east side by stone and timber quays upwards of half a mile long, on which are convenient coaling staiths, &c. The depth alongside the quays is 15 to 18 feet at low water, but the space available does not exceed 250 to 350 feet in breadth. At the north end of the town there is a dry dock of the following dimensions :—

	No. 1.
Length over all - - - -	335 feet
Width of entrance - - - -	45 „
Depth on sill at high-water of ordinary springs - - - - -	16½ „

Two other large docks are being constructed.

There is also a floating dock which will receive a vessel of 400 tons, and a gridiron, 270 feet long by 40 feet wide. Iron ship-building is prosecuted.\*

The trade consists chiefly of exports of coal ; in 1888, upwards of a million tons of coal were exported. Population in 1881 was 121,830. Vice-Consuls for France, Germany, Russia, Portugal, Sweden, and Denmark are resident. During 1888, 1,420 vessels entered the port, of an aggregate tonnage of 587,984 tons.

**Steam Tugs.**—Five steam tugs belong to the harbour.

**Supplies.**—Coal is readily procured, and vessels coaled alongside the coal shoots and the quay on the south-west side of the river, where there is a depth of 15 feet at low-water. Repairs to ships or machinery executed with facility. Water is led down to the quay, and can be supplied readily; marine stores of all kinds are abundant.

**Pilots.**—A pilot master and seventeen pilots belong to Blyth. This number will be increased shortly.

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\* For list of docks, see Dock Book ; also, for later information on docks, see Additions and Corrections to Dock Book, published annually.



**DIRECTIONS.**—On approaching Blyth harbour the buildings of Tynemouth castle, open their own breadth to the eastward of Hartley Bates, bearing S.  $\frac{1}{2}$  W., clears all Blyth rocks to the eastward. (*See view C. on chart, sheet vii., No. 1,192.*) The Link beacons in line, bearing West, clears Seaton Sea rocks to the southward; then Blyth lighthouses in line, N. by W.  $\frac{3}{4}$  W., lead into the river and up the channel, to abreast the turning when Blyth Snook lights in line lead into the harbour; but vessels are recommended to take pilots for this port, unless locally acquainted. The range into the harbour is at times considerable, owing to the conducting effect of the breakwaters, but this has been partly remedied by converting the foreshore abreast into a wave-trap. In north-east gales, Blyth should not be attempted, on account of the broadside sea, the direction of the channel, and the streams of tide.

**TIDES.**—It is high-water, full and change, at Blyth, at 3h. 15m.; springs rise 15 feet, neaps 11 feet, and neaps range 7 feet. The flood stream sets westward directly across the harbour entrance. The tidal streams into and out of the harbour change about an hour before the streams outside.

**The COAST** from Blyth to Seaton Sluice, nearly  $2\frac{3}{4}$  miles, is low and sandy, and numerous colliery chimneys show within it. One mile from Seaton Sluice is a high sand-hill called Mile hill, near which is an excellent spring of water, the Boiling Well, so named from its never freezing. A short distance within is the wood of Seaton Delaval, with its hall (partly destroyed by fire some years since) showing above it.

**SEATON SLUICE.**—The village of Hartley Pans, or Seaton Sluice, may be easily recognised by the cones of its bottle-works, which are prominent objects. Seaton burn is on the north side of the village, a short distance below which it makes an abrupt turn to the northward, and empties itself into the sea. Here piers and flood-gates were erected, and the bed of the stream was converted into a sluicing reservoir by Sir Ralph Delaval in the reign of Charles II., but from being at the head of a shallow bight, and opening in the face of the heaviest gales, it was liable to be choked up by sand, and the piers to be destroyed. A new entrance was accordingly made by a late Lord Delaval, who cut in an easterly direction through the solid freestone rock. This cut, 600 feet long, 40 feet deep, and 30 feet wide, was crossed by a drawbridge; it was secured seaward by

a double set of booms, and its direction continued eastward by a pier of masonry, on the north side 116 feet long ; the opposite side of the entrance being marked by an iron perch. This harbour is now (1887) closed, and there is no trade to the place.

**Supplies.**—Fresh water may be obtained at the Boiling Well, and other supplies at the village in moderate quantities.

**A Rocket** apparatus is provided at Seaton Sluice.

**Seaton Road.**—The bight from Seaton Sluice to Hartley Bates, distant about one mile, is sometimes termed Seaton road. It is encumbered with several dangers, viz., the Outer and Inner Bell, and Colville rocks ; the former with 6 to 7 feet over them at low-water, the latter dries ; the mark to clear them all is the same as that for Blyth rocks, the buildings of Tynemouth castle open their own breadth to the eastward of Hartley Bates, bearing S.  $\frac{1}{2}$  W., but it must on no account be tampered with, as it only just leads outside.

**The COAST**, from Seaton Sluice to the southward, is a rocky cliff of varying height. A short distance within, and on the summit of a gentle hill, is the village of Hartley, with red-tiled houses and no remarkable buildings ; beneath the village, and directly off Curry point, is Hartley Bates or St. Mary isle, a small islet, with a row of cottages, on which a chapel and hermitage formerly existed. It is 26 feet above high-water, and seated upon rocky ledges, which dry out from it for some distance at low-water. While working abreast, give it a berth of one-quarter of a mile.

From Curry point the coast is a moderately elevated bank with a sandy base, and ledges extend some distance in front of it. The villages of Earsdon and Monkseaton (the church of the former, with a tall tower, among trees) are prominent in the background. At Whitley lodge, a large mansion near the sea shore, the coast again appears as a rocky cliff, and continues so to Panarse point, which is low, with ledges projecting 2 cables from it. Within the point, upon a gently rising ground, stands the village of Whitley, and its spire-church, with Whitley park, a large mansion, surrounded by wood, on the south side of it.

**Measured Mile.**—Beacons, 6,080 feet apart, for testing the speed of vessels, have been erected northward and southward of Curry point, about 4 miles northward of the entrance to the Tyne river. The running course is N.  $1^{\circ}$  W. or S.  $1^{\circ}$  E., magnetic.\*

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*See Admiralty chart, Hartlepool to St. Abb's head, No. 1192 ; scale,  $m = 0.5$  inch.*

**Cullercoats.**—The village of Cullercoats, resorted to for sea-bathing, is upon the verge of the cliff, close to the southward of Panarse point. It is inhabited chiefly by fishermen. An opening in the rock serves as a boat haven, and two beacons on the top of the bank lead into it. A small breakwater has been built on its north side, to afford greater protection in gales from the northward.

**A Life Boat** is placed here. Cullercoats is also a rocket station.

**The COAST.**—From Cullercoats, the coast is a steep grassy bank with a sandy foreshore, forming a small bay, bounded to the southward by the low point Sharp ness, and the bold promontory Tynemouth rock.

**Bellhues Rock**, with  $3\frac{3}{4}$  fathoms over it, and 7 fathoms between it and the shore, lies nearly one mile to the south-east of Cullercoats, with Tynemouth lighthouse bearing S.W.  $\frac{1}{4}$  S., distant one mile.

The coast from Hartley Bates to Tynemouth rock is, with few exceptions, fronted by ledges, extending generally 2 cables from the main; therefore, whether running or working along it, go no nearer than half a mile.

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## CHAPTER III.

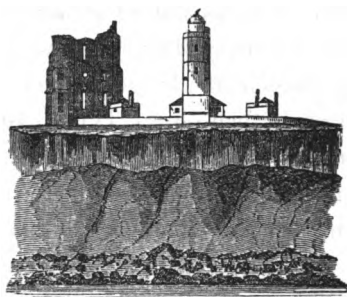
## TYNEMOUTH TO FLAMBOROUGH HEAD.

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VARIATION, from  $18^{\circ} 40'$  to  $17^{\circ} 40'$  West in 1889.

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**TYNEMOUTH HEAD, or ROCK**, is a promontory of limestone 85 feet high, crowned by a lighthouse, and the extensive remains of a priory, and a castle; it is conspicuous from every direction seaward, may be easily recognised by the mariner, and forms an excellent mark for the entrance to the Tyne.



Tynemouth lighthouse and priory

**LIGHT.**—Tynemouth lighthouse stands at the eastern extremity of the castle yard, on the edge of the cliff; it is a white stone building 75 feet high, erected in 1802, and exhibits a *red catoptric* light of the first class, *revolving once every minute*, at an elevation of 154 feet above high water, visible in clear weather 18 miles between the bearings of S.  $18^{\circ}$  W. round west and north to N.  $40^{\circ}$  E. A faint light is visible into the land to the northward.

A short distance to the south-westward of the head, and separated from it by a small sandy bay named Priors haven, and upon a cliff of lower elevation, is the Spanish battery, which commands the entrance; from this point, a high bank extends for half a mile to the westward, forming the northern boundary of the entrance to the Tyne.\* On the summit of the bank, just to the north-west of the Spanish battery, stands the Collingwood monument, consisting of a full-length figure upon a pedestal, altogether 70 feet in height. More to the westward, the railway station, the barracks, and the master

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\* See Admiralty plan of entrance to the river Tyne, No. 1,934; scale  $m = 11.8$  inches.

mariners' asylum, are all prominent objects while entering the Tyne and when approaching from the southward. The town of Tynemouth is the Brighton of the North, and is much resorted to; its site was once occupied by a Roman station subordinate to that of Wallsend, and a Roman altar, discovered in 1783, shows it was garrisoned by the 4th Cohort of Lingones.

**RIVER TYNE**, formed by the streams of the North and South Tyne, which unite near Hexham, has a course of about 36 miles in a general easterly direction to the sea at Tynemouth. This river, running as it does through the heart of a great coaling district, has long been noted as the scene of great mercantile activity. Naturally, its navigation was most difficult, although practicable, to the small vessels trading along the coast previous to the introduction of steam power. The advent of steam by causing the construction of large vessels has necessitated the improvement, or the total decline of, the small ports of the kingdom, and in no place have more improvements been made than on the Tyne. In the year 1855 there was a bar to the river, over which there was but 6 feet at low-water, above this was a second bar of stones of 9 feet at low-water, and 400 yards from this second bar the channel was but 400 feet wide. Shields harbour at the same time consisted of a narrow tortuous deep-water channel, with large shoals on either side, dry at low-water. The river from Shields to Newcastle consisted of a series of shoals with a narrow serpentine channel between them, through which vessels of about 15 feet draught could, at high-water spring tides, be conducted to Newcastle, whilst at and above Newcastle the river was almost fordable at low-water. Now (1889) there is a depth of 20 feet at low-water from the entrance to Newcastle, and the entrance is protected by noble breakwaters, whilst numerous floating docks give accommodation to the vessels frequenting the port, some of which are of 4,000 tons register. These improvements, effected entirely by local enterprise at a cost of over £4,000,000 (up to 1883), are a just source of pride to the dwellers on the banks of the coaly Tyne, who see their vigour and enterprise rewarded by the increasing traffic of the port, from whence, besides the immense coasting trade, steamers are constantly running to the Baltic, Hamburg, the Mediterranean, and North America. Owing to the elevation of the sources in Cumberland and in the borders of Scotland, the river Tyne is subject to sudden and great freshets, and discharges at such times an immense body of water.

**SHIELDS.**—The populous towns of North and South Shields extend along the banks on each side of the lower or sea reach of the Tyne. At North Shields is a sailors' home. The higher parts of both towns are modern, but at the water-side, old red-tiled houses, jetties of every shape and size, coal-staiths, tall chimneys, and cones of glass-works, may occasionally be distinguished between the masts of the tiers of shipping, and amid the dense cloud of smoke sent forth from the factories, the steam ferries, and the numerous steam tugs, which are constantly in motion. Amidst such a scene of bustle and apparent confusion it is often impossible to recognise the principal objects, which are Clifford fort, upon the sandy spit on the north side of the entrance, the Tyne lighthouses, closely adjoining, and the disused Law beacons upon the opposite side.

**Time Signal.**—At North Shields a gun is fired daily (excepting on Sundays and general holidays) at 1 p.m., Greenwich mean time. The position of the gun is on a hill a little east of the entrance to the Albert Edward dock.

**TYNE LIGHTS.**—The lower of the Tyne lighthouses at North Shields stands on the sandy spit just to the westward of Clifford fort; it is a square tower of stone, 77 feet high, and its seaward face is painted white. The high lighthouse, similarly painted, stands upon the summit of the bank in front of Dockwray square, and its lantern is 123 feet above high-water. These lighthouses bear when in line W.  $\frac{3}{4}$  N., are 240 yards apart, and each shows a *fixed white* light all night; by day, a *blue* flag is hoisted at the high lighthouse, except between half-ebb and low-water. The lighthouses, open southerly, lead in the deepest water at the entrance between the piers.\* They are visible in clear weather 16 and 13 miles respectively.

On the extremity of the groyne on Herd sand, on the south side of the river, a light is exhibited from an iron lighthouse, which *occults* every *ten seconds*. The light is *white* between the bearings of W.  $\frac{1}{2}$  N. and S.W. by W.  $\frac{3}{4}$  W., and *red* between the bearings of W.  $\frac{1}{2}$  N. and N.W. by W.  $\frac{3}{4}$  W.; in other words, it shows *red* over the south pier to as far as the end of the rubble base of that pier, and *white* between the piers and over the outer end of the north pier. The extremity of the north pier or breakwater is also marked by *three* vertical lights,

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\* It is in contemplation to alter the positions of these two lights, in order to give a better line of direction into the river.

the upper being *green*, the middle *white*, and the lower *red*. There is also a *red* light about the middle of the north breakwater.

**Pilots.**—In moderate weather there are always pilots to be found outside the Tyne, both to the northward and southward of the port, and they have built for themselves a powerful steamer, which enables them to keep the sea, and to render assistance to vessels in almost any weather.

**DANGERS at the ENTRANCE to the TYNE.**—Tyne bar, a ridge of sand, which formerly connected the Sparrow-hawk with the outer point of Herd sand, on the south side of the entrance, and over which, when in a mean state, there was a depth of only 6 to 7 feet at low-water, has been removed by dredging, and there is not less than 20 feet at low-water of ordinary springs in the channel from sea into Shields harbour.\* By the same process several serious obstructions which encumbered Shields harbour, as the Stones, In sand, and Middle ground, Dortwick, Whitehill, and other sands, have been entirely removed, and now the river possesses an unobstructed channel from the sea for several miles within the entrance. Extensive dredging operations are still in progress, with the view to obtaining further improvement in the depth up to Newcastle, and in the higher sections of the Tyne. The material excavated is taken out to sea in hoppers and deposited in a depth of 20 fathoms.

**The Black Middens** is the highest portion of the extensive rocky flat which lies out to the south-westward of the Spanish battery; the summit of it is always above water, and an iron perch with a skeleton ball stands a little within its south-eastern extremity. A detached rock to the south-westward of the Black Middens upon the side of the channel, and named the Priors Stone, is covered at  $5\frac{1}{2}$  feet flow. The remainder of the space between the Middens and Clifford fort is occupied by the Mussel Scarp, a flat composed of gravel, sand, and mussel shells.

**Herd Sand** projects to the south-east from under the Law, and forms the southern boundary of the entrance to the Tyne. On it a groyne has been built to define the south boundary of the channel, which groyne has on its end a lighthouse, previously described. The outer extremity of the sand is marked by a *black* nun buoy lying in 18 feet at low-water, and which must always be left on the port hand in entering.

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\* From information furnished by Mr. P. J. Messent, M. Inst. C.E., Engineer to the Tyne Commission, February, 1881.

**Tyne Piers.**—The great feature of the Tyne is the piers in course of construction on either side of its mouth ; they were designed by the late James Walker, C.E., and were begun in 1856.

The north pier, formed by a submerged mass of rubblestone and a superstructure of longitudinal and cross walls of masonry filled in with concrete, is to be 3,114 feet in length, of which 2,842 feet is completed ; it begins at the south angle of Tynemouth head, runs straight out in a S.E.  $\frac{1}{2}$  E. direction for 1,400 feet, and then curves easterly and southerly. The south pier, consisting for the most part of a mound of rubblestone with pitched slopes, is to be 5,290 feet in length, of which 5,111 feet is completed ; it projects from the south shore, about midway along Herd sand, straight in an E.N.E. direction for 2,800 feet, then east for 1,500 feet, and afterwards curves northward. The submerged portion of each pier extends a considerable distance farther out. Upwards of 2,600,000 tons of stone, exclusive of lime and cement, have been used in these works.

The objects contemplated by these noble works are the maintenance of a deep-water entrance channel, and the protection of it and of Shields harbour in on-shore gales.

A *red* buoy is placed in 5 fathoms at low-water at the extremity of the works of the north pier, and a *red* and *white vertically striped* buoy lies in 5 fathoms off the end of the works of the south pier. These buoys are moved outwards with the advance of the base of the works in either case.

**Shields Harbour.**—The Narrows, abreast Clifford fort, and the most contracted portion of the entrance, is rather more than  $1\frac{1}{2}$  cable across at high-water ; immediately within, the harbour of Shields expands to a breadth of nearly 2 cables, with depths of 5 to 6 fathoms over the greater portion of it. Screw moorings have been laid down on both sides of the river, extending on the north side from near the low lighthouse to Whitehill point, and on the south side from Panash point to the Tyne dock ; here occasionally 120 vessels are berthed, some waiting to fill up with coal, while others will be laden and waiting for a fair wind ; both flood and ebb sweep along the north concave shore, and thus a depth of 30 to 36 feet at low-water is maintained by the scour. A considerable range finds its way into Shields harbour at high-water in easterly gales, and occasionally the freshets are very heavy, but the security afforded by the moorings will generally prevent damage, unless the tiers be overcrowded. Vessels



are, of course, moored head and stern, and are billeted by the Harbour authorities. Immediately inside the low lighthouse at North Shields are the *Wellesley* and the *Castor*, the former vessel lent by the Admiralty as a training ship, and the latter being the drill ship of the Royal Naval Reserve. The set of moorings outside the *Wellesley*, the outer of the two vessels, is usually appropriated to any vessels of war visiting the Tyne. The range into the river has been reduced by the construction (in 1881) of a groyne to the eastward of the low lighthouse.

**Docks.—Tyne Dock.**—Jarrow Slake, a deep bight on the south side of the river, just above South Shields, had formerly an area of 350 acres uncovered at half-ebb, but 179 acres of the south-eastern portion of it are now occupied by the works of Tyne dock. This dock and its basin have an area of 50 acres ; it has two entrances 60 and 80 feet wide, respectively, with a depth of  $24\frac{1}{2}$  feet over the sills at high-water springs. There are extensive timber ponds in the western portion of the Slake. There is also a tidal basin of 10 acres, the entrance to which, 165 feet wide, has  $26\frac{1}{2}$  feet over the sill at high-water. Off Jarrow Slake is a Floating Hospital.

**Northumberland Dock**, with an area of 55 acres, and a tidal basin of 2 acres, is at Hay Hole, upon the opposite side of the river ; it has two entrances at the eastern end, respectively 50 and 70 feet in width, with a depth of 24 feet over the sills at high-water springs. It is entered by a lock 250 feet long and 52 feet wide.

In addition to the facilities afforded for the shipment of coals at these docks, the Tyne Commissioners have erected staiths with adjustable shoots at Whitehill, alongside which the depth varies from 18 feet to 25 feet at low-water, and which could load into a ship, at high-water spring tides, if the combings of the vessels' hatchways did not exceed 20 feet above the floating line, or at low-water with 15 feet greater height.

**Albert Edward Dock.**—A deep-water dock has been constructed at Coble dene, between North Shields and Whitehill point ; its dimensions are :—Area, 24 acres ; length of quays, 2,600 feet ; tidal basin,  $2\frac{3}{4}$  acres ; tidal entrance, 80 feet wide ; lock, 350 feet long and 60 feet wide ; depth on sills at high-water springs, 30 feet ; neaps, 26 feet. The outer lock sill is 6 feet lower than the sill at entrance to the dock, so that vessels drawing 20 feet can be locked in at low-water.

**Graving Docks.**—The following table gives the dimensions of the various graving docks at North and South Shields :—

	Length over all.	Length on blocks.	Width of entrance.	Depth on sill at high-water of ordinary springs.
	Feet.	Feet.	Feet.	Feet.
<b>North Shields :</b>				
H. S. Edwards & Sons, No. 5 - - -	367	—	46½	24
Young & McLearn - - - -	182	182	40	16
T. & W. Smith - - - -	300	300	60	17
<b>South Shields :</b>				
W. E. Boutland - - - -	127	122	34½	12
Moralee Brothers - - - -	176	166	32½	15
" " " " - - - -	200	132	33½	12
Tyne Dock Engineering Co. - - -	282	—	44½	18
Metcalfe & Son - - - -	195	192	33½	13½
Middle Dock Co., No. 1 - - -	332	322	60	17
" " " " No. 2 - - - -	285	279	42	18
High Docks, Edwards & Sons, No. 1	330	320	46½	17½
" " " " No. 2	305	305	40	15
" " " " No. 3	430	430	55	24
" " " " No. 4	—	320	55	24
" " " " No. 5	367	—	46½	24
<b>Wallsend :</b>				
Tyne Pontoon & Dry Dock Co., Pontoon	260	—	65	18
" " " " Dock	385½	—	80	24½
" " " " "	387	—	84	25½
Jarrow : Palmer's Ship Building Co.	440	411½	70	18
<b>Hebburn :</b>				
Leslie & Co. - - - -	450	430	68	23
J. V. C. Winlow - - - -	—	120	36	11
Jno. Morale (Sen.) - - - -	—	128	—	12

On both banks of the Tyne are numerous slipways, which will receive vessels of from 200 to 3,000 tons; there are also several floating repairing docks and gridirons.

The slipway at Palmer's, Jarrow, 600 feet long, can take up vessels of 1,600 tons

The direction and length of the several reaches from Jarrow Slake to Newcastle bridge are as follows :—

Long reach extends W.N.W. for 2 miles above Jarrow Slake; then occurs Bill reach, running S.S.W. for 1½ mile. On rounding Bill point, formerly a very sharp turn for long vessels, but which is now much improved, St. Anthony reach opens out in a West direction for half a mile; afterwards follow Brandling reach, N.N.W., ¾ mile; St. Peter reach in a West and North-west direction for the same distance; Glasshouse reach, North for one mile; and lastly Newcastle reach; this runs about West to Newcastle bridge, which was formerly the limit to navigation to vessels with standing masts. The navigable channel through these various reaches has always been narrow, and was formerly much obstructed by shoals, but its condition has been greatly improved under the extensive dredging opera-

tions which have been carried out, and the abrupt turns in the course are to be modified by the reduction of several of the protruding points.

**Bridges.**—The old bridge connecting Newcastle with Gateshead, which has been removed, had nine arches, its abutments, piers, and starlings occupied 200 feet, or two-fifths of the waterway of the river, and the soffit, or head of the centre arch, was only 18 feet above the level of high-water. The new bridge, which was completed in 1876, has four spaces, corresponding with those of the high-level bridge, a short distance westward, and is so constructed that the two central openings, each of 104 feet, are spanned by girders that, by means of hydraulic power, are swung round on the central pier, and allow masted vessels to pass through. The weight of the swinging portion is 1,450 tons, and it is 281 feet in length.

A high-level bridge with two roadways, the upper carrying the North-Eastern railway across the river, and the lower for ordinary traffic, is a short distance westward of the swing bridge; the under part of the lower roadway is about 83 feet above the level of high-water.

Redheugh bridge, a high level road bridge, crosses the Tyne about half a mile farther westward, it has four river spaces, the two mid-spaces each measuring 236 feet, and there is a clear height of 87 feet from the high-water surface to the under part of the roadway.

**NEWCASTLE-UPON-TYNE** stands upon the sides and summits of the acclivities on the left bank of the river 7 miles above Shields, and the town of Gateshead on the opposite side is similarly situated. The town presents a scene of great commercial activity; its manufactures (the most important of which are of iron) are very extensive; its public buildings are numerous, among which its fine Norman keep, the tower of St. Nicholas church, crowned by turrets and buttresses, and the elegant spire of All Saints church, are very prominent.

The Tyne exported, in 1886, 9,670,328 tons of coal and coke. Iron ship-building is a branch of trade which is rapidly increasing, while every description of repair, both of vessels and machinery, can be readily accomplished. Supplies of all sorts are abundant. The number of vessels belonging to the port of Newcastle on the 1st January, 1881, was 502, of 200,281 tons; but the aggregate number belonging to the Tyne was 1,030 vessels, of 373,055 tons. The arrivals in the Tyne ports in 1886 with cargoes and in ballast, coastwise

and foreign, were 13,544 vessels, of 6,027,745 tons. The total value of the imports was, in 1886, £1,312,007, and of the exports £10,380,827.

In 1885, the ruling (least) depth in the fair channel of the river from the entrance to Newcastle was, at low-water of spring tides, 20 feet; and at high-water, 35 feet; and from Newcastle to Elswick ordnance works on the north side, and to as far as Dunstan on the south side, 18 feet at low-water, or 33 feet at high-water, of ordinary springs.

The quay at Newcastle extends for nearly one mile in front of the town, and, in 1879, the depth of water in the berthage alongside it was from 10 feet to 20 feet at low-water, and 25 feet to 35 feet at high-water, of ordinary springs. Rails in connection with the North-Eastern railway are laid along the quay. Ample warehouse accommodation is provided, as well as every modern appliance for the rapid discharge and loading of vessels. Three of the cranes on the quay are capable of lifting, respectively, 20 tons, 60 tons, and 80 tons.

There are also warehouses and quays at Gateshead in connection with the railway system.

Population in 1881 :—Tynemouth and North Shields, 43,863; South Shields, 56,922; Newcastle, 145,228; Gateshead, 65,873.

**Life-Boats.**—Five life-boats are kept in constant readiness at the entrance of the Tyne, as well as a plentiful supply of other apparatus for saving life. Greathead, the inventor of the life-boat, was a resident of South Shields, where he built his first boat in September, 1789.

**DIRECTIONS.**—Approaching the Tyne from the southward, keep Tynemouth lighthouse in line with the three vertical lights on the end of the north pier, N.W.  $\frac{1}{4}$  W., so as to clear the submerged portion of the south pier, and when the lighthouses at North Shields appear in line, W.  $\frac{3}{4}$  N., proceed with them so, and they will lead in midway between the piers until Tynemouth light is in line with the *red* light on the north breakwater, N.W. by N., when a W.  $\frac{1}{4}$  N. course must be steered, and North Shields high light, gradually brought open to southward of the low light, so as to pass in mid-channel between the Black Middens on the northern shore, and the light on the embankment, upon Herd sand, and on through the Narrows into Shields harbour; when having arrived abreast the New quay, or a little above it, an anchor may be let go, or a warp be run out to the

moorings, as most convenient. Throughout this track there is not less than 20 feet at low-water. If closing the entrance from the northward give Tynemouth castle and the Spanish battery a berth of over half a mile, until Tyne lighthouses appear in line ; then proceed in as before directed.

Northerly gales cause the highest sea at the entrance, but there is no difficulty in taking it in winds from N.E. to S.E., provided the ebb has not made strongly.

**CAUTION.**—When the sea is high, endeavour to enter before the flood stream has ceased running. In N.N.E. and southerly gales vessels should borrow close upon the *red* buoy off the end of the North pier, or the *red* and *white vertically striped* buoy at the end of the south pier works, as the case may be ; and on arriving under the shelter of the piers assistance will be obtained.

**Harbour Regulations.**—The following are the most important of the regulations in navigating the river Tyne :—

(a.) All vessels to be moored under the direction of the Harbour Master, and to obey his directions with reference to turning in anchors, boats, &c.

(b.) Vessels are to keep south of mid-channel when proceeding to sea and north of mid-channel when entering, so as always to pass each other on the port side.

(c.) Vessels crossing the river or turning must be responsible they do not interfere with the passing traffic.

(d.) When one vessel is overtaken by another she shall give her room to pass.

(e.) All vessels towing in from sea must shorten the tow rope to fifteen fathoms before entering the Narrows.

(f.) Steam vessels to ease their engines and be cautious when passing dredgers. When the dredgers are at work they exhibit a white flag. When their moorings are so taut as to be dangerous to passing vessels they exhibit by day a *red* flag and by night a *red* light on the *dangerous* side, warning vessels to pass on the other side.

(g.) The special moorings for the Commissioners' vessels are painted *white*, and are not to be used by other vessels.

(h.) No ashes, ballast, or refuse of any description to be thrown into the river.

**TIDES.**—It is high-water, full and change, at the entrance of the Tyne, at 3h. 20m.; springs rise  $14\frac{1}{2}$  feet, neaps  $11\frac{1}{2}$  feet, and neaps range  $7\frac{3}{4}$  feet. At North Shields, springs rise  $14\frac{3}{4}$  feet, and neaps range  $7\frac{3}{4}$  feet; at Newcastle quay, springs rise  $15\frac{1}{2}$  feet, and neaps range 8 feet; and at Elswick works springs rise  $15\frac{1}{2}$  feet, and neaps range  $9\frac{1}{8}$  feet. The lift of a spring tide between Shields and Newcastle, as well as in the higher section of the river, has not only been considerably increased by the dredging operations, but high-water at Newcastle now occurs only 12 minutes later than at the entrance to Shields harbour, instead of one hour after, as was the case in 1858; and the difference in the time of high-water at Newcastle and at Newburn, 6 miles farther up, has been reduced from 29 minutes to 8 minutes.

The **COAST** to the southward of the Tyne is composed of sand-hills, but changes to limestone at Trow point; within, the ground rises into a gentle hill, having the village of Westoe on its summit. Directly abreast Marsden house (which is whitewashed, with a slated roof) is a small inlet among the rocks, named Man haven. The coast hereabouts is cliff of soft magnesian limestone, from 50 to 60 feet in height, and the bold detached mass, Marsden rock, as well as many other rocks of varied size and form, serve to show the resistless action of the sea upon it. Ledges also skirt the whole shore, and a berth of one-quarter of a mile should be given it.

Marsden is a rocket station.

**SOUTER POINT**, between Man haven and Whitburn, shows prominently, whether approaching it from the northward or southward, and it serves to deflect the sea somewhat from Sunderland harbour in heavy northerly gales.

**LIGHTS.**—A circular white light-tower, 76 feet high, has been erected on Souter pont. The illuminating apparatus is electric and *flashing*, exhibiting a *white flash every half-minute* at an elevation of 150 feet above high water. It is visible in clear weather 20 miles. A *fixed* light, also electric, is exhibited from the same tower, 21 feet below the flashing light, showing *white* from the bearings N. by W. to North, and *red* from the latter bearing to N. by E.  $\frac{3}{4}$  E. The *fixed white* light leads over the Mill rock and Cope Carr point, and when it changes to *red* leads over Whitburn Stile, Hendon rock, and White Stones. Owing to the erection of chemical works in the

vicinity, the low light is partially obscured between the bearings of N.  $\frac{1}{4}$  E. and N.  $\frac{1}{2}$  E. when southward of Whitburn Stile, and from N.  $\frac{1}{4}$  E. to N.  $\frac{3}{4}$  E. when between Whitburn Stile and Souter point.

**Fog Signal.**—A powerful fog-horn is sounded in thick or foggy weather. The horn is situated seaward of the lighthouse, and gives *one blast every minute*, equally distributed through an arc of 180 degrees, viz., from N.  $\frac{1}{4}$  E., through east, to S.  $\frac{1}{4}$  W.

**Cleadon hill**, with a windmill on its west end, is immediately within Souter point. The village of Whitburn, with its church showing above the trees, stands a short distance back from the coast line to the southward of Cleadon hill.

A **Life-Boat** is stationed at Whitburn, and also rocket apparatus.

**Mill Rock**, with 18 feet water upon it, and 4 and 5 fathoms about it, lies abreast the village of Whitburn, and half a mile from the high-water margin, with the church bearing W. by N.  $\frac{3}{4}$  N. The *fixed* light at Souter point shows *white* over this rock, and the sea breaks upon it in heavy weather. From Whitburn to Sunderland, the coast consists first of sandhills, and then of limestone cliffs. The terrace at Roker is prominent upon the summit of the latter, a short distance to the northward of Sunderland harbour.

**SUNDERLAND,\*** comprising the parishes of Sunderland, Bishopwearmouth, Hendon, and Monkwearmouth, stands upon both banks of the river Wear, at its junction with the sea; the square towers and spires of its churches, the capacious warehouses at the south docks, some tall chimneys, and the lighthouses upon the piers, are among the principal objects noticed by the mariner; but, like Shields, it is black and gloomy; in fact the whole town is often obscured by a dense cloud of smoke. It is celebrated for its ship-building, as well as for the production of coal, lime, and glass. The church of St. Peter at Monkwearmouth on the north side of the river Wear is not only the oldest in the county, but was the first church glazed in England. In 1880, 3,573,483 tons of coal were shipped from Sunderland. The exports, besides coal, are patent fuel, chemicals, paper, iron, glass, lime, &c.; timber, iron ore, esparto grass, grain, &c. are imported. In 1880, 456 vessels, of 190,979 tons, belonged to the port; and 7,858 vessels, registering 2,238,876 tons, cleared from the port. Population in 1881 was 116,262.

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\* See Admiralty plan of Sunderland, No. 1,627; scale, = 12 inches.

**Piers.**—A curved breakwater (Roker pier) is being constructed three cables north of the entrance to the river Wear. At present, 1888, it extends about 1,714 feet from the shore, and is being extended at the rate of about 300 feet per annum. Its total length will be about 2,760 feet, and it is a part of new works contemplated for enclosing, at the entrance to the Wear, an area of 55 acres. The extremity of the pier is marked by three vertical lights, the upper *red*, the middle *white*, and the lower *green*, and the extremity of the submerged works by two *black* buoys. The lights and buoys are moved forwards as the work progresses.

The piers at the entrance of the river Wear were begun in 1720, and from various additions that have since been made they now project out a considerable distance; they are built of substantial masonry, and are creditable to the spirit and perseverance of the port. The entrance between the piers is 126 yards in width, and its direction is east and west.

**LIGHTS and SIGNALS—North Pier Lights.**—On the outer end of the North pier is a handsome stone lighthouse, painted white, which, though 75 feet high, and weighing 338 tons, was removed bodily 150 yards from the former end of the pier to the position it now occupies, by Mr. Murray, a late resident engineer. It exhibits a *fixed white* light, which is 73 feet above high-water, and is visible in clear weather from 13 to 14 miles; a *fixed red* light is also shown 18 feet lower in the same tower. Both lights are shown from sunset to sunrise throughout the year.

**South Pier Lights.**—From a white lighthouse near the South pier-head, a *white* tide-light, 58 feet above high-water, is exhibited from half-flood to two hours after high-water; and from high-water until two hours after high-water an additional *white* light will be shown underneath the first light. The lights illuminate seaward an arc of  $130^{\circ}$ , extending from the North pier lighthouse on the north to the South beacon on the south, and are regulated to appear of less brilliancy than the North pier light, but should be visible in clear weather at the distance of 10 miles.

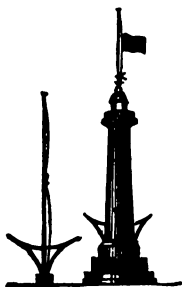
A *green* light shown under the tide-light at the South pier indicates danger in the harbour and that it is necessary to attend to orders hailed from the south pier. When blue lights are burnt at the same lighthouse, and no tide-light is shown, it is to denote that a vessel's entry would be attended with extreme danger.



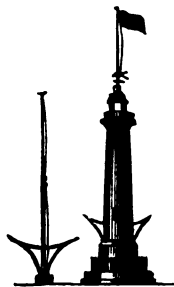
**Tidal Signals.**—In the day-time a *red* flag is exhibited at the South pier from half-flood until two hours after high-water, and from the time of high-water until the expiration of the two hours an additional flag is exhibited under the first-mentioned flag.

**Fog Signal.**—In foggy weather, a bell is sounded for one minute in every three minutes from half-flood until two hours after the time of high-water.

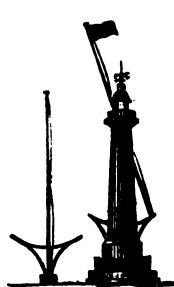
The following signals (as they appear from seaward) are made from the south lighthouse for the guidance of vessels taking the harbour in stormy weather, when it is impracticable to obtain a pilot.



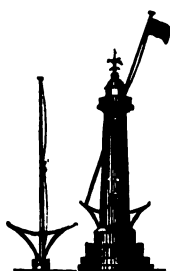
Half-tide.



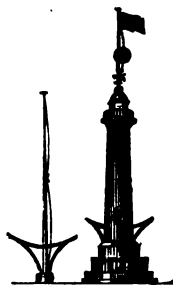
Safe for ships to enter.  
Also—in bad weather when  
no pilot is on board—You  
are coming in the channel.



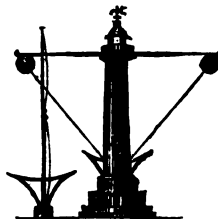
Flag inclined to the  
South—Keep the ship  
more southerly.



Flag inclined to the  
North—Keep the ship  
more northerly.



Danger in the harbour ;  
Be careful.



Entering will be attended  
with danger.

Upon the auxiliary flagstaff represented in the view, similar signals are made to vessels running for the harbour with risk after the lighthouse flag has been lowered.

During the progress of operations in the harbour, a red flag, marked C.R.W., is shown upon the dredger or other vessel during the day, and a *red* light at night, and which all vessels must steer clear of.

**Life-Boats. &c.**—Rockets and every appliance for saving life are kept in constant readiness upon both piers, and there are life-boats near the North and South piers, the South outlet, and at Whitburn.

**Docks.**—There are wet docks immediately within the entrance to the harbour, named according to their respective positions, North and South, the Commissioners Dock is 437 feet in length by 50 feet in breadth, the depth over the sill at high water being  $19\frac{1}{2}$  feet.

**The North dock**, at the inner end of the North pier, was opened in 1837, and is 6 acres in extent, with an average depth of 17 feet; the width of the entrance is 50 feet, and the sill is  $20\frac{1}{2}$  feet below high-water of ordinary springs; there is also a small tidal basin of  $1\frac{1}{2}$  acre. As originally constructed, a considerable amount of sea found its way into the basin and to the gates, but this defect has been partially remedied.

**The South docks** consist of the Hudson dock North, Hudson dock South, and Hendon dock.

Hudson dock North, opened in 1850, is within the beaching ground at the inner end of the South pier, and from its having been formed out of the low rocky foreshore, that was covered at high-water, to the southward of the harbour, is considered an engineering work of considerable merit: an extension of this dock, known as Hudson dock South, was completed in 1856. The tide harbour (entered from the river) is  $2\frac{3}{4}$  acres in extent, and is connected to the half-tide basin of  $2\frac{1}{2}$  acres within by Nos. 1 and 2 entrances, respectively 45 and 60 feet in width; No. 3 entrance into the dock from the half-tide basin is 65 feet wide, and the sill of No. 1 entrance is  $20\frac{1}{2}$  feet, of No. 2 entrance 23 feet, and of No. 3 entrance 28 feet below high-water of ordinary spring tides. Hudson dock North has an area of  $18\frac{1}{2}$  acres, and Hudson dock South of  $14\frac{1}{4}$  acres; the depth in both is about 28 to 24 feet at high-water springs. The Hudson dock can also be entered from the South outlet.

Hendon dock, of 11 acres, opened in 1868, is to southward of Hudson dock, with which it is connected by an entrance 60 feet wide, and having a depth over the sill of  $23\frac{1}{2}$  feet at high-water of ordinary springtides; it is also entered direct from the South Outlet, through Hendon channel, the entrance being 60 feet wide, with a depth of  $26\frac{1}{2}$  feet over the sill at high-water of ordinary springs. The depth of water in this dock is  $29\frac{1}{2}$  feet at high-water of ordinary springs.

**South Outlet.**—The seaward entrance to the southern docks, known as the South Outlet, was opened in 1856; it is upwards of three-quarters of a mile to southward of the entrance of the river Wear, and is formed by breakwater piers, which project E. by N.  $\frac{1}{4}$  N. and S.S.E., and embrace an area of 28 acres, the width between the pier-

heads being 220 feet. The channel, with a depth of 29 feet at high-water of ordinary springs, leads up either to the Hendon dock, or to a lock 481 feet in length by 90 feet in width, fitted with gates worked by hydraulic power, which have a clear opening of 65 feet into the Hudson docks. There is a depth of 27 feet over the outer sill, 30 feet in the lock, and  $25\frac{1}{2}$  feet over the inner sill, at high-water of ordinary springs.

**LIGHT.**—From the extremity of the north-east pier of the southern outlet an *occulting* light is exhibited *eclipsed twice every ten seconds* as follows—light of *seven seconds* duration ; eclipse *one second* ; light *one second* ; eclipse *one second*. The light is *white* and *red*, elevated 45 feet above high water, and visible over an arc of  $96^\circ$ , as follows ; as a *white* light over an arc of  $34\frac{1}{2}^\circ$  northward of Hendon rock, between the bearings of W. by S.  $\frac{1}{3}$  S. and W. by N.  $\frac{3}{4}$  N. ; as a *red* light over the Hendon rock (an arc of  $19\frac{1}{2}^\circ$ ) between the bearings of W. by N.  $\frac{3}{4}$  N. and N.W.  $\frac{1}{2}$  W. ; as a *white* light over an arc of  $15^\circ$  southward of Hendon rock, or between the bearings of N.W.  $\frac{1}{2}$  W., and N.W.  $\frac{7}{8}$  N. ; as a *red* light over an arc of  $15\frac{1}{2}^\circ$  marking the White stones, or between the bearings of N.W.  $\frac{7}{8}$  N., and N. by W.  $\frac{3}{4}$  W. ; as a *white* light over an arc of  $11\frac{1}{2}^\circ$  south westward of the White stones, or between the bearings of N. by W.  $\frac{3}{4}$  W., and N.  $\frac{3}{4}$  W. ; and as a *red* light over an arc of  $35^\circ$  towards the shore, between the bearings of N.  $\frac{3}{4}$  W. and N.N.E.  $\frac{1}{3}$  E.

**Signals.**—The following signals are shown from the semaphore signal-post on the north side of the outer roundhead of the lock :—

—	Day Signals.	Night Signal.
No 1. The passage through the lock into the dock is open.	Two raised arms at the mast-head.	Two white lights, one above the other, on the mast.
2. Vessels may enter lock from sea.	One raised arm at the mast-head.	White light, with red light below, on the mast.
3. Vessels are about to pass out to sea.	One drooping arm at the mast-head.	Red light, with green below, on the mast.
4. The gates are not yet open.	Arms down.	Two red lights, one above the other, on the mast.
5. Vessels entering from sea must pass up Hendon dock channel.	Two drooping arms on the mast.	Two green lights, one above the other, on the mast.
6. No vessel can be allowed to enter the lock or docks this tide.	Black ball on the mast-head.	Three red lights on the mast.

N.B.—No signals will be given for vessels to enter from sea unless there be 15 feet water or upwards on the sills of the outer gateway of the lock.

Before permission can be given to vessels to enter from sea, one or other of the following signals must be made by them, as the case may be, viz. :—

—	Day Signals	Night Signals.
To enter the dock.	Ensign hoisted at the maintop-gallant mast-head.	Green light under the mast-head light.
To enter the lock.	Jack under the ensign.	Red light under the mast-head light.

**Graving Docks.**—There are six graving docks of the following dimensions :—

		Length over all.	Length on blocks.	Width of entrance.	Depth on sill at high-water of ordinary springs
		Feet.	Feet.	Feet.	Feet.
Commissioners, No. 1	-	437	410	50	19½
„ No. 2	-	353	350	60	16½
Wear -	-	315	300	45	15½
Bridge-	-	326	315	48	13½
Deptford	-	300	300	45	15
Cornhill	-	400	390	43	16

The Strand slip, which will take up vessels of 1,200 tons gross register and of about 800 tons dead weight, is 600 feet long and 40 feet broad.

The total water space of the South docks, &c., amounts to 78 acres 3 roods 21 perches ; and the length of quayage to upwards of 10,000 feet.

The masting sheers at Hudson dock South are equal to lift 60 tons through 70 feet ; and those at Hendon dock, 50 tons through 50 feet. There are also steam and hydraulic cranes for loading and discharging cargoes.

There are three warehouses at Hudson dock for storing grain, which will each hold from 10,000 to 12,000 quarters ; also sheds for esparto grass and general goods, and large cattle lairs.

Rails are laid round the docks which are in connection with the general railways.

The North-Eastern engine works, for the construction and repair of steam machinery, occupy a large space on the east side of Hudson dock : there are the necessary appliances for removing the built-up engines from the works and placing them entire on board ships in the dock.

**Hendon Rock and White Stones.**—Both north and south of

the entrance to Sunderland harbour extensive ledges project from the shore marked at their outer ends by beacons. There are also two detached rocks to the southward in the offing abreast Hendon, which are greatly in the way of vessels approaching the harbour. Hendon rock, the northern of the two, has 5 feet upon it at low-water, and lies, with the North pier lighthouse bearing N.N.W.  $\frac{1}{3}$  W., distant  $1\frac{1}{3}$  mile; when on it Fulwell windmill is in line with South beacon, N.W.  $\frac{7}{8}$  N., and Humbleton trees are just opening south of White house, West; its position is marked by a *black bell* buoy, surmounted with staff and globe in 43 feet at low-water, with North pier lighthouse N.N.W.  $\frac{3}{4}$  W. and Sea banks farm W.  $\frac{1}{4}$  N. The White Stones, with 10 feet upon them at low-water, are S.  $\frac{1}{2}$  W. nearly six cables from Hendon rock. From them North pier lighthouse appears in line with the centre of Roker terrace, N. by W.  $\frac{1}{2}$  W., and the base of South Maidens Paps in line with Hall's farm W.  $\frac{1}{4}$  N. These dangers are covered by the *red* sector of Souter point lower fixed light, as well as by the *red* sectors of the light on the north-east pier of the southern outlet to Sunderland docks.

Five *red* buoys lie outside the roadstead, in 10 fathoms at low-water, to define the boundary within which vessels are prohibited from casting ballast.

**RIVER WEAR**, of which Sunderland harbour is the outlet, is a narrow and rapid stream, 65 miles long, and confined, for the greater part of its course, between high banks of limestone rock. Draining as it does a considerable surface of hilly country, the land floods often descend with great force, and, at times, when there has been ice in the river, they have caused serious damage to the shipping. Property to the amount of 15,000*l.* was thus destroyed in the course of a few hours in 1841, owing to the want of proper moorings, a defect which has since been remedied.

**The Bar** is generally half a cable outside the pier-heads, and, when in a mean state, has 3 feet over it at low-water; the depth, however, varies between 2 and 4 feet. The deepest channel is usually about 20 yards from the face of the North pier, continuing seaward over the bar in an easterly direction, but it is occasionally forced to the southward or northward, according to the prevailing wind and sea.

The Potato Garth, a large expanse on the north side of the river immediately above the North dock, is valuable as a beaching ground

and stilling basin. Above the Garth the river is very contracted, the average width being less than 130 yards. Its direction is S.W.  $\frac{3}{4}$  W. for a short distance, and then W. by N.  $\frac{3}{4}$  N., and the shipping are moored in close tiers on both sides, leaving but a narrow waterway between them. In many of the berths they lie aground at low-water, upon a hard and irregular bottom.

**Bridges.**—One mile from the pier-heads the Wear is crossed by a cast-iron bridge, which was erected towards the close of last century, and was long one of the engineering wonders of the country. Its single arch has a span of 236 feet, resting upon abutments of solid masonry, the crown of the arch being 80 feet above high-water: vessels of considerable burden pass under it with their top-gallant masts struck. It was strengthened and improved in 1858.

A short distance to the westward is a high-level bowstring girder bridge of the North-Eastern railway; this bridge has a span of 300 feet, and has a clear height of  $81\frac{1}{2}$  feet above high-water of ordinary spring tides.

The river continues narrow and winding for  $1\frac{1}{4}$  mile above the bridges; its width then increases considerably, and the greater portion of its bed dries at low-water; at Hylton,  $1\frac{1}{2}$  mile farther, the river again becomes narrow, and so continues for the remainder of its tidal course.

On the banks of the river are extensive ship-building yards, rolling mills, glass works, paper mills, and three large marine engine works, which have 80-ton sheers for putting the engines in a completed state into vessels.

**Pilots and Steam Tugs** are constantly in attendance outside the harbour in moderate weather.

**DIRECTIONS.**—In approaching Sunderland harbour from the southward, keep Monk Heselden windmill (11 miles south of Sunderland) well open of Hawthorn point, bearing S. by W.  $\frac{1}{2}$  W., to clear the White Stones and Hendon rock; Cleadon windmill ( $1\frac{1}{4}$  mile inside Souter point), open to the eastward of Bent house (on the coast  $1\frac{1}{4}$  miles north of the entrance to the Wear), N. by W., leads to the eastward of them. Bent house has a red-tiled roof, and is the first house upon the shore to the northward of Roker cliff, but as this mark is distant, and often obscured by smoke, a better plan to clear both rocks on the outside is to keep the North pier lighthouse to the westward of N.W.  $\frac{1}{4}$  W., and they will have been passed, coming from

the southward, when Building hill, near Sunderland, appears open to the northward of the score at Hendon, bearing W.  $\frac{3}{4}$  N.; and coming from the northward, when South Maiden-Pap opens south of Hendon inn W. by N. In approaching the bar from the northward, keep the North pier lighthouse to the westward of S.W. At night keep in the *white* sector of the Souter point lower light.

Building hill, immediately south of the town, is of limestone formation, and curiously connected with local superstitions.

There is no difficulty in entering Sunderland harbour, wind and tide permitting, nor even in strong easterly winds, if the vessel's steerage can be depended upon. The usual plan is to close the North pier on a W.  $\frac{1}{4}$  S. bearing, in order to avoid the rocks to the northward and southward, the extremities of which are marked by beacons; afterwards, to keep within 20 yards, or thereabouts, of the North pier, and when abreast the North dock basin a course may be shaped for mid-channel and up to the berthage.

**CAUTION.**—The harbour is exposed in winds from N.N.E., round easterly, to S.S.E., and gales from E.N.E. to E.S.E. send home the heaviest sea. In taking the harbour with the wind well to the N.E. or S.E., it is necessary to carry a good press of canvas, on account of the heavy sea across the entrance.

No vessel should attempt the harbour under sail with the wind to the southward of S.S.E., for she could not lay the course in, and an anchor would be of no use. Vessels entering during the flood should round the North pier end closely; otherwise, as the tidal stream sets strongly across the mouth of the harbour, the danger would be incurred of being carried alongside the South pier. This danger will probably be entirely overcome when Roker pier is completed.

**TIDES.**—It is high-water, full and change, at 3h. 22m.; ordinary springs rise at Sunderland pier  $14\frac{1}{2}$  feet, and neaps to 11 feet; neaps range  $7\frac{1}{2}$  feet. Winds from N.N.W. to N.N.E. cause the highest floods and check the ebbs, while those from S.S.E. to S.S.W. depress the high-water and make low ebbs; the tidal flow reaches Biddock ford, 8 miles above the bar. The tidal stream in the river Wear and close to the coast changes at high and low water, but at a distance of one mile from the shore the change of stream is one hour after high and low water, whilst, at four or five miles off, the stream changes three hours after high and low water. The flood stream running to the southward, the ebb to the northward.

The **COAST** to the southward of Sunderland consists of grassy bank with a rocky base, intersected at Hendon, Ryhope, and Seaham by deep ravines, or "denes," as they are locally termed ; and as the whole extent is fronted by ledges, projecting in places for some distance, a berth of half a mile should be given it. Tunstall Law, with a double summit, called the Maiden Paps (362 feet), and Warden Law (637 feet), a conical hill with a clump of wood and colliery chimney near its crest, are prominent in the background, while Old Seaham church and rectory, surrounded by trees, are distinct objects on the north side of Seaham dene. The rectory is used as a clearing mark for Liddle Scars, foul ground to the southward of Seaham.

**SEAHAM**, as respects the town and harbour, had no existence a few years since, both having been formed by the late Marquis of Londonderry, the proprietor. At a spot devoid of the least natural capability, and presenting a barrier of limestone cliff 50 to 60 feet high, with straggling rocks at its foot, substantial piers and docks have been constructed and connected with the interior by railways. The docks are generally full of shipping, and the whole scene must be regarded as one of the most remarkable instances of private enterprise which the country can produce.\*

The trade of Seaham is principally confined to the export of coal and glass bottles. 592,674 tons of coal were exported in 1880. 61 vessels belong to the place, and about 2,500 vessels enter the port annually, of an aggregate tonnage of 660,000 tons. Population about 8,000.

**Harbour.**—By means of piers combined with excavation, commenced in 1828, there have been formed an outer harbour of 4 acres ; North wet dock of  $3\frac{1}{2}$  acres, South wet dock of  $2\frac{3}{4}$  acres, and a Light harbour, or harbour for light-draught vessels, of 3 acres, affording altogether accommodation for about 120 vessels. The outer harbour is formed by east and south piers, the opening between them being 115 feet in width, and facing the south. This harbour dries at low-water springs, but the channel through it is kept clear of accumulation by occasional sluicings from the wet docks. The South dock has a double set of gates, but the North dock has only a single set, defended by booms. There is no connection between these docks, an inconvenience which is greatly felt. The Light harbour adjoins the South wet dock to the southward. The width of the entrance to the North dock is

\* See Admiralty plan of Seaham harbour, No. 1,625 ; scale, mile = 17·6 inches.



33 feet, South dock 32 feet, and Light harbour 40 feet; while the depth at high-water springs in the outer harbour is 15 feet, North dock 17 feet, South dock 16 feet, and Light harbour 12 to 13 feet. The latter dries at low-water springs, and the bottom throughout is limestone marl, with a coating of silt and sea sand.

**LIGHTS and SIGNALS.**—A handsome stone lighthouse, 58 feet high, stands upon Red-acre point, a bluff cliff on the north side of the entrance basin. The light, which was first shown in December, 1844, is *white, fixed*, and 94 feet above high-water, and it may be seen 14 miles off in clear weather; there is also a *red light revolving every half-minute* in the same tower, 49 feet above high-water, and visible at the distance of 11 miles in clear weather. During night tides, when safe to enter, a *red light* is also shown from the South pier-head, and by day a *red flag*, hoisted upon the flagstaff above the railway platform between the docks, answers the like purpose.

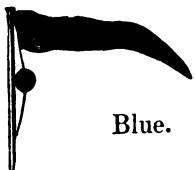
From the same flagstaff the following storm signals are made :—



Tide Flag.

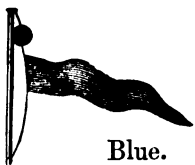
Red.

No vessel to attempt the harbour when this flag is not hoisted. At night, a *bright red light* is shown on the South pier as a tide signal, and no vessel must attempt the harbour when the light is not shown.



Blue.

Keep to windward until tide-time. Pilots and steamboats will go off if practicable.



Blue.

Use your own discretion; there is no prospect at present of pilots or steam-boats getting off.



The harbour cannot be attempted. You had better make a port before dark.

Blue lights are burnt in the night-time when the harbour cannot be attempted.

**A Life-Boat**, rockets, and lines, are stationed at Seaham.

**Patent Slip**.—There is a patent slip, 180 feet long and  $18\frac{1}{2}$  feet wide, adapted for vessels of 400 tons, and a gridiron 180 feet in length, in the Light harbour.

**Liddle Scars, &c.**—Seaham harbour is beset to the northward and southward by extensive rocky ledges, which partly dry at low-water, and there are also several detached sunken rocks to the southward named Liddle Scars, the outermost of which, the North Scar, having 3 feet upon it, is S.E.  $\frac{1}{2}$  S. one-third of a mile from the East pier-head. Tangle rock, just to the southward of the harbour entrance, and separated by a clear space one cable wide from the East pier-head, is a continuation of the rocky foreshore, and just dries at low-water springs. Besides these, there are several rocky patches, with 7 to 11 feet over them, farther off-shore; the outermost of them, the North-east Bush, being nearly abreast Tangle rock.

**Pilots**.—Seaham maintains forty-eight pilots.

**Steam tugs**.—There are two steam tugs attached to the port; the signal for one being an ensign at the main mast-head by day, and one white light at the yard arm by night.

**DIRECTIONS**.—Old Seaham rectory, seen to the eastward of Featherstone rock, bearing N.W.  $\frac{3}{4}$  N., clears Liddle Scars in 10 feet at low-water, but leads in-shore of 7 feet on East Tangle rock; the safest plan, however, if closing from the southward, is to give the shore a berth of three-quarters of a mile until the entrance has been brought to bear between W. by N. and West, the direction for approaching it. If from the northward, a vessel will be outside all the dangers by keeping half-a-mile from the shore, until the entrance bears as above. By night, do not go into a less depth than 8 fathoms, and steer for the light on the South pier-head when it bears W. by N.

E.S.E. gales cause the heaviest sea at the entrance, and with scant north-easterly gales it is difficult for a vessel under sail to fetch clear of the South pier-head. To guard against damage to the gates, no vessel is allowed to enter the port, under ordinary circumstances, except in charge of a pilot, but in cases of emergency, when such assistance cannot be procured, care must be taken to luff short round

the East pier-head, and then if the rope for checking the vessel's way be missed, the beach on the north side of the entrance basin may be taken.

The bottom in the offing is foul to the southward of the line of the entrance bearing W.  $\frac{1}{4}$  S., a point which must be remembered when taking up an anchorage to wait tide-time, and there is also no protection except with off-shore winds.

**TIDES.**—It is high-water, full and change, at Seaham, at 3h. 24m.; springs rise  $14\frac{1}{2}$  feet, neaps  $10\frac{1}{2}$  feet, and neaps range  $6\frac{1}{2}$  feet. The tidal stream does not, however, turn at high and low water, the south-going stream along the coast running from half-flood to half-ebb, and the north-going from half-ebb to half-flood; consequently it is always slack water at half-tide, and the stream is at its full strength at high and low water.

**The COAST** to the southward of Seaham consists of cliffs from 70 to 90 feet in height, which, like those to the northward, are interrupted by denes; of these Hawthorn, Foxhole, and Castle Eden are the most remarkable; some bottle works and blast furnaces are near the coast a short distance south of Seaham, while Kirby-hill tower (square and castellated), Hawthorn hall, Easington church, and Monk Hesleden windmill are all prominent objects. From the high land of Easington the back country declines in height towards Hartlepool; cliff ceases at Crimden dene, and the coast then continues sandy for  $2\frac{1}{2}$  miles to the Heugh, the low rocky peninsula on which the town of Hartlepool stands. The shore is foul for a part of the distance, but a berth of half a mile will clear all dangers.

**Blackhalls** watch-house, standing near the shore midway between Castle Eden and Crimden denes, is a rocket station.

**Measured Mile Marks.**—Between Crimden denes and Hartlepool posts have been erected, to enable vessels to try their speed. They are one mile apart.

**HARTLEPOOL**, situated upon a peninsula which projects boldly beyond the line of coast on either side, takes its name from a former pool, or inlet of the sea, 181 acres in extent, to the westward of the town. In ancient times it was a place of importance and a perfect specimen of a fortified town, having walls, bastions, and a fortified port belonging to the bishops of Durham, who kept their galleys in it.

This harbour was entire at the beginning of the 19th century, but its site is now occupied by the Victoria dock. The most prominent buildings, as seen from the offing, are St. Hilda church, a noble structure said to have been erected by the Venerable Bede, the spires of other churches, and several factory chimneys.

The seaward cliffs of Hartlepool peninsula are being slowly wasted by the action of the sea. Walls have had to be constructed outside them in places, and it seems probable that the whole external face will have to be protected in this manner.

In 1832 the decay of Hartlepool was so complete that it had dwindled down to a small village containing a fishing population of a thousand souls, and only three vessels belonged to it; but owing to a judicious improvement of natural advantages, its advance has been rapid. The old harbour has been dredged out to a depth of 10 to 12 feet at low water. A channel to it has been dredged to a depth of 12 feet. Spacious docks have been constructed, and a fine fish market built at the head of the tide harbour.

**WEST HARTLEPOOL**, situated upon the low shore between Hartlepool and the village of Seaton, has been altogether created since 1845. At a spot offering little natural facility, a tide harbour and a series of wet docks have been excavated, with graving docks, coal-staiths, warehouses, building yards, and timber ponds, and all the appliances of a first-class port. On the beach in front of West Hartlepool are remains of a fossil submerged forest.

Like the entrance to the Tyne and Sunderland, Hartlepool is often shrouded in a dense cloud of smoke and coal dust, so that the land cannot be distinguished at any distance.

The exports from Hartlepool harbours in 1880 consisted of 1,128,683 tons of coal and coke, besides cottons, carpets, woollens, silks, cement, iron, machinery, &c.; the principal imports are grain, timber, and general goods. Shipbuilding in iron and timber is carried on to a considerable extent. The number of vessels that entered the two ports was 6,313 in 1886, of an aggregate tonnage of 1,080,316 tons. The population of the town in 1881 was 45,000.

**Harbours, Docks, &c.**—Up to 1835 the only harbour possessed by Hartlepool (if harbour it could be called) was the space between the present lighthouse pier and the sea-wall of the town, as the slake

or pool already alluded to was too shallow for the purpose ; and vessels were moored to posts fixed along the pier, and exposed to all the drawbacks of such imperfect shelter. In 1832, attention having been called to the remarkable natural advantages belonging to the place, the Hartlepool Dock and Railway Company obtained an Act for the improvement of the port, and a tide harbour of 20 acres in extent, with 1,800 feet of quayage, was formed in the outer part of the slake, by carrying a mound, furnished with sluices, across it ; the harbour, and a straight channel connecting it with the sea, kept clear by dredging, are defended eastward by the old pier, and westward by a jetty. In 1838, further accommodation having become necessary to meet the increased trade of the port, the Victoria dock of 20 acres was excavated out of a tract of waste ground between the tide-harbour and the town, including the site of the ancient fortified port. An entrance lock, 45 feet wide and 148 feet long, with its sill 5 feet below low-water springs, connects this dock with the tide harbour.\* The depth in the dock is 23 feet, and the depth over the sill 22 feet at high-water ordinary springs.

The works at West Hartlepool consist of the West harbour of 41 acres, Coal or West dock of 8 acres, Jackson dock of 13 acres, Swainson dock of 9 acres, Union dock of 8 acres, and Central dock of 13 acres. The lock or entrance of Coal dock is  $40\frac{3}{4}$  feet, of Jackson dock  $58\frac{3}{4}$  feet, and of Swainson dock  $48\frac{3}{4}$  feet in breadth, and all the sills are laid  $5\frac{1}{2}$  feet below low-water springs. Union dock of 8 acres, and Central dock of 13 acres, which are connected with each other, and with Jackson dock, occupy a portion of the site of the Slake. Union dock is entered from the West harbour through a half-tide basin, and Central dock from Hartlepool tidal harbour by a lock 600 feet in length by 200 feet in width, named the North basin ; the entrances to each are 60 feet wide ; and, at low-water of ordinary spring tides, there is 10 feet on the sill of the north entrance, and  $5\frac{1}{2}$  feet on that of the south entrance. At high-water of ordinary springs there is 26 feet depth of water in both docks, and in the lock, and  $21\frac{1}{2}$  feet in the south basin. Central dock was opened in 1880. There are timber ponds of 57 acres in extent on the west side of these docks.

These docks and basins thus unite the previously existing docks and harbours at Hartlepool and West Hartlepool.

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\* See Admiralty plan of Hartlepool bay, No. 1,628 ; scale, mile = 9 inches.

**Graving Docks.**—There are four graving docks at the port of the following dimensions :—

	No. 1. In Jackson Dock. feet.	No. 2. In Swain- son Dock. feet.	No. 3. In West Harbour. feet.	No. 4. In Central Dock. feet.
Extreme length - - -	385	360	315	570
Length on blocks - - -	340	325	308	540
Width of entrance - - -	60	50	47	50
Depth on sill at high-water springs - - - -	15	16	15	19
Depth on sill at high-water neaps	11	12	11	15

**Patent Slip.**—There is a slipway in the old harbour which will accommodate a vessel of about 500 tons, and two hards.

There are several pairs of sheer legs at the port, constructed to lift the heaviest class of machinery.

**Supplies.**—Supplies of every description are plentiful. Water is laid down round the docks. Vessels can be coaled with facility in the old harbour, as well as in the docks. Repairs to ships are readily executed. There is a local hospital.

**A Breakwater**, to assist in protecting Hartlepool bay from north-east gales, projects in a S. by E.  $\frac{1}{2}$  E. direction from the southern part of the Heugh. This work, of sandstone, with a hearting of concrete, which was originally 260 yards long between high and low water, and with a parapet 20 feet above high-water of spring tides, is now (1886) 400 yards in length, and will be extended 60 yards further.

**LIGHTS.—Heugh Lights.**—A stone lighthouse stands upon the south-east extremity of the Heugh; the light from it, first shown in October 1847, is *fixed, white*, elevated 84 feet above high-water, and visible in clear weather at the distance of 15 miles from every direction seaward. A *fixed red* light is also shown 22 feet below the white light in the same tower, from half-flood to half-ebb, and by day a *red* ball is hoisted upon the lighthouse flag-staff during the same interval of tide.

**East Harbour Lights.**—A *fixed red* light, at an elevation of 37 feet, in a wooden lighthouse at the end of the Old pier, marks the west extremity of the foul ground from the Heugh, as well as the entrance channel.

Two *red* lights for leading up the cut at night, and bearing N. by W.  $\frac{1}{2}$  W. when in line, are shown near the dock office at the outer part of the East harbour, also two lights (having the seaward slides darkened) near the old Ferry landing on the Middleton sands.

**West Harbour Lights.**—A *fixed green* light is exhibited from the north-pier head of the West harbour from sunset to sunrise. Two *red* lights, bearing when in line N.W.  $\frac{1}{4}$  N., and leading into the entrance, are shown when there is a depth of 10 feet into the West harbour, and the same depth by day is indicated by a *red* flag at the head of the north pier.

**Signals at West Harbour.**—No vessel to enter Jackson dock by day until a *red* ball is hoisted at the gaff-end of the flagstaff on the north side of the entrance to that dock, nor by night until a *red* light is shown on the south side of the entrance to that dock.

No vessel to enter the Coal dock by night until a *green* light is shown at the south side of the entrance to the dock.

**Life-Boats, &c.**—A life-boat is stationed on the sands three-quarters of a mile north of the Heugh, two in the East harbour, one in the West harbour, and one near the brewery to the southward of West Hartlepool. There is besides rocket apparatus for saving life.

**DANGERS in HARTLEPOOL BAY.**—Several dangers bound the approach to Hartlepool harbour. The Heugh is bordered by a rocky foreshore 2 cables in width, the southward extremity of which is marked by a beacon standing a little outside the Old pier.



Heugh beacon

**The Stones**, detached rocks, having 2 to 4 feet over them, are off the south-east part of the Heugh, just eastward of the breakwater.

**Buoy.**—A *black* conical buoy, surmounted by a wicker ball, is moored in 22 feet outside the Stones, and off the end of the breakwater; from it, the Heugh lighthouse bears N.  $\frac{1}{2}$  W., distant one-third of a mile; the lighthouse on the Old pier, N.W. by W., nearly half a mile; and the North pier-head of West Hartlepool harbour, W.  $\frac{3}{4}$  N., three-quarters of a mile.

**The Long Scar**, upon the south side of Hartlepool bay, and forming its defence on that side, is an extensive ledge of rock projecting at right angles from the shore abreast Carr house.

**Buoy**, a *black* bell buoy, surmounted by a staff and globe, lies outside the Long Scar, in 22 feet; with the Heugh lighthouse bearing N.  $\frac{1}{2}$  W.  $1\frac{1}{6}$  mile; lighthouse on Old pier, N.N.W.; north pier-head of West harbour, N.W. northerly; and Seaton high lighthouse, in line with the north end of Carr house, W.  $\frac{1}{3}$  S.



**Anchorage.**—With the exceptions just noticed, the whole of Hartlepool bay is clear. The day marks for the anchorage are, All Saints church, Stranton, in line with Newburn sailless windmill, bearing West; and St. Hilda church, Hartlepool, N.  $\frac{1}{3}$  W.; in 3 fathoms at low-water, muddy sand over clay. By night, anchor with the East harbour leading lights just open to the westward of the Old pier light, and the light upon the Heugh bearing between N. by E.  $\frac{3}{4}$  E. and N.N.E.  $\frac{3}{4}$  E.

**Hartlepool Bar** has been removed by dredging, and the channel leading into Commissioners harbour has a minimum depth, at low-water spring tides, of 13 feet, which depth it is proposed to increase by further dredging.\* Owing to the judicious arrangement of the works, only a slight range finds its way into the harbour in strong winds from north-east and south-east. The outer portion of the channel is marked by two *black* buoys to the eastward, the outer one carrying a staff and ball, and by three *white* buoys to the westward.

**West Hartlepool Harbour** has a plain approach, and the depth between the piers and in the entrance channel is from 7 to 10 feet at low-water springs. Like the other artificial harbours in its neighbourhood, easterly winds bring an addition to the silt, but the above depth is maintained by continual dredging.

**Pilots** for Hartlepool may always be obtained in moderate weather and steam-tugs are in attendance at tide-time.

**DIRECTIONS.**—In rounding the Heugh, give it a berth of one-third of a mile, then by keeping a cable outside the Heugh breakwater the Stone will be cleared to the south-westward, should the buoy be out of place. Approaching from the southward, the Long Scar will be abreast when Seaton high lighthouse is seen over the low outbuildings on the north side of Carr house, bearing W.  $\frac{1}{3}$  S., but while working near it, keep the Heugh lighthouse to the westward of N.  $\frac{1}{2}$  W. (the mark for clearing the Long Scar to the eastward), and when Stranton church shows open to the northward of Newburn brewery, bearing W. by N.  $\frac{1}{2}$  N., the ledge will have been passed, and the bay may be entered. At night, to clear the Long Scar, Commissioners harbour leading lights should not be brought to the westward of the Old pier light.

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\* From information supplied by Mr. William Belk, Engineer to the Port and Harbour Commissioners, March 1881.



In fine weather, and with a leading wind, there is no difficulty in entering Commissioners harbour ; pass between the *black* buoys and *white* buoys marking the channel, and when the light-posts near the dock office appear in line, N. by W.  $\frac{1}{2}$  W., keep them so, and proceed through the cut into the tide-harbour, in which there are buoys for mooring head and stern, and where there are locks for entering the docks. The head of this harbour is crowded with fishing boats during the herring season. By night, the Old pier *red* light bearing North, and the West harbour *green* light W. by N.  $\frac{1}{2}$  N., mark the entrance of the channel, the course through which is N.  $\frac{1}{2}$  W. to abreast the Old pier light, when the harbour leading *red* lights in line, N. by W.  $\frac{1}{2}$  W., lead up to the harbour ; but a stranger should not attempt to enter without a pilot.

A W.  $\frac{1}{2}$  N. course for three-quarters of a mile leads from the buoy outside the Stones to the West harbour. The course in is N.W. by N., and no special directions for entering are necessary, beyond the general caution to be observed in using harbours of this sort, viz., to keep sufficient canvas set, and have an anchor and warps ready. By night, keep the *red* leading lights in line, N.W.  $\frac{1}{4}$  N., and the *green* light on the north pier-head on the starboard bow while entering.

**REFUGE.**—In the heaviest on-shore winds, by waiting for the proper period of tide, there is nothing to prevent a vessel from taking Commissioners harbour, or at least getting into a position of safety, where a steamer will be able to take hold of her, tug-boats being always in attendance at tide-time. A vessel so circumstanced must pass just outside the buoy of the Stones, and then steer so as to pass midway between the beacon upon the Heugh rocks and the *black* buoy with staff and ball marking the channel, and a pilot will generally be able to board shortly after it has been passed. Should a vessel miss the entrance, or be unable from stress of weather to keep off until tide-time, the beach to the southward of the entrance, Middleton strand, may be taken, where life is always safe, and from whence the vessels also are generally got off.

**CAUTION.**—In north-easterly and easterly gales, loss has frequently resulted from vessels keeping so far outside the break of the sea upon the Stones as to be unable to fetch up to a position where a steamer could take hold of them ; but this may be prevented by keeping close to the buoy as above directed.



**TIDES.**—It is high-water, full and change, at Hartlepool, at 3h. 28m. ; springs rise 15 feet, neaps 11 $\frac{3}{4}$  feet, and neaps range 8 feet. The tidal stream outside runs to the southward 3 hours after high-water.

The **COAST** from Hartlepool to the Tees is composed of sand-hills, not more than 20 feet high. Adjoining West Hartlepool is the village of Stranton, with a tower church (All Saints), and two white windmills. Newburn sailless windmill, useful as a mark for clearing the Salt Scars near Redcar, is about the middle of West Hartlepool ; the ridge upon which Hart windmill stands, and a small conical hill named Elwick beacon is based, forms a back-ground to the whole.

**SEATON CAREW**, a pretty bathing village, stands upon the shore 1 $\frac{1}{2}$  mile to the southward of West Hartlepool. The pinnacles of its church tower (the chief object) show over the houses.

A **Life-Boat** and rocket apparatus are stationed here for the succour of vessels stranded at the mouth of the Tees.

**LIGHTS.**—Near Seaton Carew are the lights leading to the fairway buoy of the Tees, the high lighthouse being half a mile within the village, and the low lighthouse near its north end ; they are white, and stand 1,183 yards apart. The high light is *white*; the low light is *red* ; they are, respectively, 89 and 34 feet above high-water, and both are *fixed*. When in line, bearing N.W. by W.  $\frac{1}{4}$  W., they clear the Salt Scars, as well as lead to the fairway buoy of the Tees.

The sandy coast terminates at the mouth of the Tees in a few detached hummocks named Seaton Snook.

**RIVER TEES**, the divisional mark between the counties of Durham and Yorkshire, after a course of 85 miles, joins the sea at the head of Tees bay between Seaton Snook to the north-west, and Bran sand to the south-east.\* To within 5 miles of its outlet the river is narrow and winding, but the banks then recede from each other, and embrace a large basin more than 3 miles in width. This space is, for the most part, occupied by sand-banks that are uncovered at low-water, and through these, with varying direction and depth, and rather inclining towards the southern shore, the river formerly pursued its course to the sea. It is now, however, confined to a certain extent by training walls, and a part of the sands are in course of reclamation.

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\* See Admiralty plan of Tees bay, No. 2567 ; scale, mile = 3·0 inches.

Up to the beginning of the present century that portion of the Tees between the head of its wide estuary and the town of Stockton was very tortuous ; but, since then, two cuts across some sharp bends of the river have shortened the distance from Stockton to the sea very considerably, and thereby removed a cause of detention, while the estuary channel has been materially improved. In the rainy season the freshes are strong, and convey down considerable quantities of sand and gravel.

**North and South Gares.**—The entrance to the Tees, confined between extensive banks of sand named the North and South Gares, was formerly, in common with nearly all rivers with sandy outlets where there are no artificial works to insure permanence, constantly varying in direction and depth. In 1855, however, the Tees Commissioners commenced extensive and important works. Half-tide training-walls from Stockton to near the bar have been formed for fixing and deepening the channel, a breakwater over the South Gare has been constructed and one on the North Gare commenced. These several works are formed by the deposit of slag (the refuse from the blast furnaces), the training-walls being marked at intervals by beacons.

**Breakwaters.**—The breakwater on the eastern side of the entrance of the Tees, known as the South Gare breakwater, 4,700 yards long, was commenced in 1863 ; the foundation is formed of slag, on which a wall of concrete has been built, the outer end being made up with bags of concrete weighing 20 tons ; it extends from Tod point over the flat of Bran sand in a N. by W.  $\frac{3}{4}$  W. direction, curving round to N.N.E.  $\frac{1}{2}$  E. to within a short distance of the bar. Its extremity is N.N.E.  $\frac{1}{2}$  E. 1480 yards from the powder magazine. On the North Gare it is in contemplation to form another breakwater in an easterly direction from the coast three-quarters of a mile to the northward of Seaton Snook.

**LIGHT.**—A *flashing* white light, which gives a flash of *three seconds'* duration every *ten seconds*, is exhibited at an elevation of 55 feet above high-water from the lighthouse on the outer extremity of the South Gare breakwater. The light is obscured when it bears northward of a W.N.W. bearing. The lighthouse is painted white, and the light should be seen in clear weather 10 miles.

**Fog Signal.**—In thick or foggy weather a steam whistle or buzzer, at the end of the breakwater, gives *two* short blasts *every half-minute*.



Slag has been deposited in the deeper water for the foundation of the North Gare breakwater.

**Training Walls.**—The half-tide training-wall on the eastern side of the channel terminates at four cables inside the South Gare breakwater lighthouse ; its extremity is marked by a circular beacon formed of concrete, surmounted by a staff and open bar gate and diamond.

The western training-wall has been carried out to a position N.W.  $\frac{1}{4}$  W. 4 cables from the South Gare lighthouse ; its submerged end is marked by No. 2 black buoy.

**Bar.**—The bar, in 1885, had a least depth of 20 feet at low-water over a breadth of about 200 yards, and 18 feet over a breadth of 500 yards at about 3 cables within the fairway buoy, and deepening to 4 to 6 fathoms in places within. There appears to be a depth of not less than 16 feet at low-water springs in the best track in the river as far as the Stones, but thence it is reduced to 12 and 11 feet as far as Middlesbrough, and to the bend beyond it ; from thence to Stockton the depth is about 10 feet. The rise at Middlesbrough at springs is 13 feet. This increased depth is due to the training-walls and breakwater.

**BUOYS.**—The following buoys mark the entrance to, and the channel of, the Tees:—

**Fairway Buoy**, a large spherical buoy, *striped black and white horizontally* with staff and diamond, lies a fair berth outside the bar, in 5 fathoms ; with Seaton lighthouses in line, bearing N.W. by W.  $\frac{1}{4}$  W., and Fifth Buoy lighthouse and Seal lighthouse in line, S.W.  $\frac{1}{4}$  W. Then the channel to as far as Fifth Buoy light is marked by four *black* conical buoys on the starboard or North Gare side\* ; and by three *black and white chequered can* buoys on the port or South Gare side to the concrete beacon at the end of the training-wall on the right bank of the river ; and then by beacons and Fourth Buoy light on this training-wall. After passing the Fifth buoy light the training-walls on both sides of the river are marked by beacons.

Farther up, the channel, in addition to the beacons, is marked by two *black conical* buoys on the western side, and by two *black and white chequered can* buoys on the eastern side, at places where shoal water extends beyond the training-walls.

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\* On 28th May 1889, a gas buoy, showing a fixed *white* light, and from which the South Gare lighthouse will bear E.N.E., will be substituted for No. 3 black buoy.

The buoys, which are under the control of the Trinity House of London, are shifted immediately upon any change in the bar or channel occurring, but the foregoing description of relative positions and colour will always hold good.

The channel through the estuary of the Tees to as far as Middlesbrough is well buoyed, beacons, and lighted.

**Stones.**—The Stones, a ledge of rock extending obliquely and partly across the channel,  $2\frac{1}{2}$  miles within the bar, is marked by No. 6 *chequered black and white* buoy. The western extreme of this ledge has been reduced, and there is a depth of 14 feet at low-water in the fairway abreast.

**LIGHTS.**—Seaton lights in line, bearing N.W. by W.  $\frac{1}{4}$  W., lead only to the Tees fairway-buoy, and not over the bar; this latter purpose is served by Fifth Buoy light and Seal light.

**Fifth Buoy Light**, a *fixed red* light, is exhibited, 26 feet above high-water, from a red lighthouse upon the western training-wall, about  $1\frac{1}{4}$  mile within the bar; "Fifth Buoy Light" is painted on the bulwark or gallery.

**Seal Light**, a *fixed red* light, 42 feet above high-water, is exhibited from a building, painted red and white horizontally, upon Seal sand, and bears S.W.  $\frac{1}{4}$  W. a little over a cable from Fifth Buoy light. In line with Fifth Buoy light it leads over the bar.

**Fourth Buoy Light**, a *fixed green* light, is on the eastern training-wall, N.E. by E., distant  $3\frac{1}{4}$  cables from Fifth Buoy light.

**Seventh Buoy Light**, *fixed and white*, is also on the eastern training-wall, 2 cables N.W.  $\frac{1}{4}$  N. from the north extreme of the Stones. The remainder of the channel up to Middlesbrough is marked by two *red* lights, and two *white* lights.\*

**MIDDLESBROUGH**, 6 miles from the outlet of the Tees, and  $4\frac{1}{2}$  miles below Stockton, is a manufacturing town of recent creation. In 1820 only one house stood on the site of this place, which now contains upwards of 55,000 inhabitants; and this house is carefully preserved by the inhabitants, who are proud of the youth of their town. Originally a flourishing coal port, its character was altered by the discovery of iron ore in the Cleveland hills, which rise at the back

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\* One of the lighthouses formerly used for leading over the bar is still standing upon Bran sand.

of the town. The existence of coal and iron together in abundance close at hand at once pointed it out as a suitable place for iron and steel manufacture on a large scale; and it possesses blast furnaces equal to any in the world for size and scientific construction. Its progress, though rapid, has not been uninterrupted, a serious objection being made at one time to the iron produced here, owing to the Cleveland ore being infested with phosphorous; but a process has been discovered for removing the phosphorous, and the iron is now converted into steel of the best quality.

The large manufacture of steel and iron in this neighbourhood has led to the improvements previously mentioned in the river Tees, to the construction of wet and dry docks for the use of the shipping transporting the produce, and to the establishment of building yards for the construction of vessels. Ships of large tonnage and vessels of war are now built here.

**Dock.**—The Gare dock at Middlesbrough, opened in 1841, is 12 acres in extent, and is approached from the main channel of the Tees by a cut one-quarter of a mile long; there are two locks 132 feet in length, and 30 and 58 feet in width; the depths on the sills at springs are, respectively, 18 feet and 22 feet 3 inches; and at neaps 15 feet and 19 feet 3 inches. The dock is being enlarged 3 or 4 acres.

**Graving Dock.**—There is a graving dock of the following dimensions:—

Length from gates to head	-	-	-	521 feet.
„ on the blocks	-	-	-	500 „
Width of entrance	-	-	-	50 „
Depth on sill at high-water of ordinary spring tides	-	-	-	16½ „

Also a slipway which will accommodate vessels up to 1,050 tons register.

The sheer legs are capable of lifting 50 tons.

**A Life-Boat** is stationed at Middlesbrough.

**Port Clarence**, a shipping place for the coal brought down by the Clarence railway before the traffic was diverted to the more convenient harbour of West Hartlepool, and where are several blast furnaces, is nearly opposite to Middlesbrough. Railways connect Stockton with Port Clarence and Hartlepool, on the north side of the Tees, and with Middlesbrough, Guisborough, Redcar, and Saltburn, on the south side.

**STOCKTON**, upon the left bank of Tees, about 11 miles from its outlet, is a place of considerable antiquity, and was at one time the residence of the bishops of Durham. Its trade has been principally with Holland, Hamburg, the Baltic, and British North America. On the completion of the railway connecting it with Darlington, in 1825, a coal trade was speedily established, but as the impediments of the navigation opposed effectual obstacles to an increase of traffic, the railway was extended in 1830 to Middlesbrough, and the coals were shipped from thence. The first bridge that crosses the river Tees is at Stockton. The manufactures are chiefly of linen and sailcloth, and iron shipbuilding is now carried on to some extent.

One hundred and thirty vessels, of 32,936 register tons, belonged to Stockton and Middlesbrough on the 1st of January 1881.

In 1880, 187,714 tons of coal and coke were shipped on the Tees, and during the same year the arrivals were 4,748 vessels, of 1,218,403 tons. Population of Stockton in 1881, 41,040.

**Pilots** for the Tees may be always obtained in the neighbourhood of Tees bay when the weather admits.

**Steam-tugs.**—Powerful steam-tugs are provided.

**DIRECTIONS.\***—In approaching the bar of the Tees from the northward, keep Hartlepool Heugh lighthouse to the westward of N. by W.  $\frac{1}{2}$  W., to clear the Long Scar, and to close the fairway-buoy; when Seaton high lighthouse appears well open to the southward of Carr house the Long Scar will have been passed. If approaching from the southward, great care should be observed to avoid the Salt Scars abreast Redcar, for they project a considerable distance off-shore. Elwick beacon, a small conical hill upon the same ridge as that on which Hart windmill stands, open to the northward of Seaton Carew, bearing N.W. by W., or Seaton lighthouses in line, N.W. by W.  $\frac{1}{4}$  W., leads outside the Salt Scars, which will have been passed when the monument to Captain Cook on Barnaby moor bears to the southward of S.W.  $\frac{1}{2}$  S.; Seaton lighthouses kept in line will lead up to the fairway-buoy. At

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\* In the opinion of experienced local shipmasters and pilots the bar can be taken with safety, and vessels after crossing are immediately under the shelter of the breakwater.

They also state that in gales from the North the bar is sheltered by Hartlepool Heugh; and in north-east gales heavier seas are frequently experienced outside than at the head of the bay, and ships put back into the Tees.—Originally published in *Hydrographic Notice, No. 7, of 1879.*

night the light on the South Gare breakwater kept in sight leads north of the Salt Scars.

In proceeding across the bar, keep between the *black* buoys, marking the North Gare, and the *chequered black* and *white* buoys upon the South Gare, with Fifth Buoy lighthouse and Seal lighthouse in line, bearing S.W.  $\frac{1}{4}$  W., and then between the *black* buoys and the beacons marking the eastern training-wall; this leads in through the channel to as far as Fifth Buoy hole, where anchorage may be taken up, within 2 to 3 cables of Fifth Buoy lighthouse, in 4 or 5 fathoms at low-water.

At ordinary spring-tides, the depth at high-water between the bar and Middlesbrough is 24 feet, and from Middlesbrough to Stockton 18 feet.\*

**By Night**, having rounded Hartlepool Heugh at the distance of one-third of a mile, keep the light upon it to the westward of N. by W.  $\frac{1}{2}$  W., until Fifth Buoy light and Seal light have been brought in line bearing S.W.  $\frac{1}{4}$  W. When Seaton high light bears W.  $\frac{3}{4}$  N. the Long Scar will have been passed. From the southward, Seaton lights in line, bearing N.W. by W.  $\frac{1}{4}$  W., will lead a clear berth outside the Salt Scars, and up to the fairway-buoy, where the Bar lights are in line.

**CAUTION.**—The glare from the numerous blast furnaces bordering the estuary of the Tees below Middlesbrough is generally visible for a long distance seaward, and some care is necessary in distinguishing the lights used in the navigation of the Tees.

From the character of the entrance to the Tees it should never be resorted to for shelter in an on-shore gale if it can by any possibility be avoided, and unless a vessel is deeply embayed she may always fetch Hartlepool, which is a harbour of refuge under all circumstances when the tide is up. Tees bar is not so dangerous for crossing in a north-east gale as in one from south-east, when the sea is upon the vessel's broadside, and to touch upon either of the Gares would be nearly certain destruction.

**TIDES.**—It is high-water, full and change, at Tees bar, at 3h. 45m., at Middlesbrough at 3h. 55m., and at Stockton at 4h. 25m. Springs rise 15 feet at Tees bar, 13 feet at Middlesbrough Dock, and  $11\frac{1}{2}$  feet at Stockton bridge; and neaps rise  $12\frac{1}{4}$  feet at the bar,  $10\frac{1}{4}$  feet at

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\* From information furnished by Mr. J. Fowler, M. Inst. C.E., Engineer to the Tees Conservancy, February 1881.



Middlesbrough, and  $8\frac{1}{2}$  feet at Stockton. The tidal flow extends 14 miles above Stockton. The tidal stream outside runs to the southward 3 hours after high-water on the bar.

**REDCAR.**—From the mouth of the Tees to the villages of Coatham and Redcar, which closely adjoin each other, the coast is low and sandy. There is a church with a spire at Coatham, and windmills at each end of the village. The tower of Redcar church shows a little above the houses. Behind are Barnaby and Burleigh moors, with arable slopes and wooded summits, patches of a brown colour here and there marking the extensive quarries of ironstone. A monument erected to the memory of Captain Cook is a prominent object at the north-west projection of the former hill.

**Piers.**—About 200 yards eastward of Coatham hotel, a pier, on piles, 600 yards in length, extends from the shore in a N. by E.  $\frac{1}{2}$  E. direction ; its head is marked by a *fixed red* light.

Another pier, also on piles, and upwards of 400 yards long, projects in a N.E. by E.  $\frac{1}{4}$  E. direction from abreast Redcar church.

**A Life-Boat** is stationed at Redcar, and rocket apparatus at Coatham.

**SALT SCARS.**—The Red Cars, or Salt Scars as they are commonly termed, are two remarkable rocky ledges abreast Coatham and Redcar, extending in an easterly direction nearly one mile from the main, and parallel to each other. The Stones, across the channel of the Tees, is supposed to be a continuation of the same rocky feature. From the position and apparent character of the Salt Scars, the space between them has attracted attention as a site for a harbour of refuge, to prevent the annual loss of life and property which takes place in Tees bay.

**Buoy.**—A *black* conical buoy lies off the outer extremity of these rocks, in 9 fathoms at low water, with Cook's monument over Redcar south-east windmill, bearing S.W.  $\frac{1}{2}$  W., and Hart windmill, a little open to the northward of Newburn sailless windmill, N.W.  $\frac{1}{4}$  N.

The Salt Scars will be abreast when Cook's monument shows over Redcar church, bearing S.W.  $\frac{1}{2}$  W. ; and they will be cleared, passing to the eastward, by keeping Hart windmill, open to the northward of Newburn sailless windmill, N.W. ; or Elwick beacon, open to the northward of Seaton Carew, N.W. by W. ; or Easington church, standing upon the high outline north of Hartlepool, open to the

eastward of Hartlepool Heugh, N.N.W.  $\frac{3}{4}$  W. By night, they will be cleared by keeping Seaton lights in line, N.W. by W.  $\frac{1}{4}$  W., and Hartlepool Heugh light to the westward of N.W.  $\frac{1}{2}$  N.

**The COAST** from Redcar to Marske is sandy ; very little of the latter village is seen from the sea, but its spire-church upon the bank-top close to the shore is a very plain object, and some houses of a superior description have lately been erected near the waterside.

The bottom is rocky and foul from the Salt Scars to abreast Marske, and one patch, named the High, with only 12 feet over it, lies upwards of one mile off shore.\*

From Marske, the coast gradually increases in height to Saltburn.

**SALTBURN-BY-THE-SEA**, so named to distinguish it from the old village of a few houses upon the shore, was built a few years since for the accommodation of seaside visitors ; it stands upon a bank on the west side of a steep ravine, and has an imposing appearance from the sea, having a pier extending about 500 yards into the sea, at which steamers touch almost daily in the season from Scarborough, Whitby, Hartlepool, and Middlesbrough. A large mansion half a mile up the wooded glen adjoining appears on some points of view. A branch railway connects Saltburn with Redcar, Middlesbrough, and Stockton. A coast-guard station stands upon the opposite bank.

**A Life-Boat**, rockets, and lines, are stationed at Saltburn.

**HUNTCLIFF**, one mile to the eastward of Saltburn, and the south-eastern boundary of Tees bay, is a bold cliff, 360 feet high, nearly perpendicular, and of a dark red colour : Beacon hill (549 feet), a rounded termination to the ridge, is seen a short distance back.

**CAUTION.**—Several vessels have been lost upon the Salt Scars from mistaking Barnaby moor for Huntcliff.

**Skinninggrave.**—At the head of a small bay between Huntcliff and Redcliff, at the mouth of a deep ravine, is the village of Skinninggrave. The bay in front, named Skinninggrave Wych, or Wick, is often used as an anchorage by small vessels in southerly winds ; the best position is with Marske church, just open of Huntcliff, bearing N.W. by W.  $\frac{3}{4}$  W., and the village of Skinninggrave S.W.  $\frac{1}{4}$  S., in 5 or 6 fathoms, clay.

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\* See Admiralty chart of east coast of England, sheet VI. ; Flamborough head to the Tees, with views, No. 1,191 ; scale, mile = 0·5 inch.

**REDCLIFF**, S.E.  $\frac{1}{2}$  E.,  $3\frac{1}{2}$  miles from Huntcliff, is one of the boldest features of the Yorkshire coast, being 666 feet above high-water ; the extensive alum works of Boulby are upon its south-east slope, and there are several other works of a similar description near its summit ; the refuse from these works is scattered over the face of the cliff and being of a deep red colour, has probably given it its name. The shore between Huntscliff and Redcliff is foul for one-third of a mile off, and a corresponding berth must be given it ; the same remark applies to the whole coast to nearly as far as Whitby.

**Staiths**, a fishing village shut in by high bluffs, 2 miles from Redcliff, stands on the east side of a small creek, or beck ; the ground behind rises steeply, and the village is besides so covered in by the cliffs, as to be visible from the sea only between a few points of bearing ; the houses descend so close to the sea that they are liable to be swept away in a storm, and 13 houses have been destroyed in this manner ; they are generally red-tiled, and the flagstaff of a coast-guard station stands on the summit of the cliff upon the east side of the village. Between the two “steels” or ledges in front of Staiths, the fishing cobbles belonging to the place find shelter in off and along-shore winds, but the want of a small breakwater, a work for which there is a convenient site, and which might be constructed at a moderate cost, has long been felt. It is, however, a busy place in the herring season, at which time smoke-houses for drying the fish are built against the cliff. Two *white* lights, 15 feet apart, are exhibited from a part of the village called Seaton Sarth during the winter for the convenience of the fishermen belonging here, one of these lights is changed to *red* when it is unsafe for vessels to enter.

**A Life-Boat** and apparatus for saving life are placed at Staiths.

**STAITHS OLD NAB**, one-quarter of a mile to the south-eastward of the coast-guard flagstaff, is a low black cliff, and as it is the most advanced point of this line of coast, vessels bound to the coal ports usually take a departure from it. From Staiths Old Nab, Souter point bears N. by W.  $\frac{3}{4}$  W., distant 32 miles ; Hartlepool Heugh, N.W.  $\frac{1}{2}$  N.,  $16\frac{1}{4}$  miles ; Huntcliff, N.W.  $\frac{3}{4}$  W., 6 miles ; and Saltwick Nab, near Whitby, S.E.  $\frac{1}{2}$  S.,  $7\frac{2}{3}$  miles.

**Port Mulgrave and Wreckhills**, two small private shipping places for ironstone, between Staiths Old Nab and Runswick bay, have their breakwaters partly wrecked by the sea. Port Mulgrave

is particularly useful to the Staiths fishermen, who here obtain shelter and accommodation for the general purposes of their fishery.

**RUNSWICK BAY.**—High cliffs of alum shale extend from Staiths Old Nab for 2 miles to the south-eastward to Runswick bay, the shore of which, skirted by grassy banks, has a highly cultivated back-ground. The village of Runswick is in the north-west corner of the bay. Runswick bay has at various times been mentioned as a suitable locality for a harbour of refuge, but its apparent capacity is deceptive, as it is encumbered by sunken ledges, particularly off Kettleness, its south-eastern boundary. Small vessels anchor within Kettleness Steel in southerly and south-easterly winds, and in the body of the bay with north-westerly winds.

**Life-Boat.**—Runswick is a life-boat station.

**KETTLENESS and KELDER STEEL.**—Kettleness, which is red and precipitous, and with some alum works upon it, is succeeded by cliffs of greater elevation to as far as the village of Sandsend, which stands at the mouth of a wooded vale. Kelder Steel, one mile to the northward of Sandsend-ness, projects one-third of a mile from the coast, and must be carefully avoided. Huntcliff, or Redcliff, kept in sight outside of Staiths Nab clears both Kettleness and Kelder Steels; but a better mark from Runswick bay, and which clears Kelder Steel and Upgang rocks, and leads right into Whitby road, is Ling hill lighthouses, showing over the outer part of Saltwick Nab, bearing S.S.E.  $\frac{1}{4}$  E. Lyth church and Mulgrave castle, the latter in a richly wooded domain, are prominent a short distance inland of Sandsend.

**Rockets** and lines are kept at Kettleness and Sandsend.

**SANDSEND BAY**, formed between Sandsend-ness and Upgang rocks, is a common anchorage in north-westerly winds for vessels bound to Whitby, or to the northward. The marks are, Mulgrave castle bearing from W.  $\frac{1}{4}$  S. to W. by S.  $\frac{1}{4}$  S., and Staiths Old Nab kept in sight, N.W.  $\frac{3}{4}$  N., in 6 fathoms, sand over clay.

**UPGANG ROCKS.**—A broad sandy strand extends from Sandsend to Whitby; above it are steep banks and a bold diversified back-ground, with Aislaby windmill and Sneeton castle on the outline. About midway to Whitby, Upgang rocks, with 5 feet over them, and 5 fathoms close outside them, extend for three-quarters of a mile from the main; they will be cleared passing to the eastward by keeping

Staiths coast-guard flagstaff, which shows above and a little within the Old Nab, bearing N.W.  $\frac{1}{2}$  N., or Staiths Old Nab a little open of Kettleness.

**A Life-Boat** is stationed at Upgang.

**WHITBY**, a town of considerable importance even at the period of the Norman conquest, occupies a beautiful position on both banks of the Esk, at its junction with the sea. The extensive ruins of its celebrated abbey of St. Hilda, upon the summit of the east cliff, its ancient church, closely adjoining, and imposing modern terraces upon the west cliff, are the most notable buildings, and all are prominent from the sea.

The trade of Whitby is still of importance, though it has declined in several of its branches. Sixty years ago Whitby sent eleven vessels, each with a crew of fifty men, to Greenland whale fishery, but since the year 1840 not a single whaler has sailed from the port ; and the harbour revenue, which was aided by a passing toll till 1861, has been only sufficient for the maintenance and progressive improvement of the works. Coal is imported principally from Hartlepool and Middlesbrough. Freestone, for harbour and engineering purposes, is exported in considerable quantities from neighbouring quarries ; alum is imported from adjacent works ; and since the opening of the Whitby and Pickering branch of the North-Eastern railway, in 1833, ironstone has annually been exported, principally to the Tyne ; an increasing supply of this material is being obtained. There are eight building slips, five repairing docks, and one patent slip. The docks are from 150 to 250 feet long, 44 feet wide, with 9 feet over the sill at high-water. The registered shipping of the port amounts to 178 vessels, of 63,017 tons. The average number of vessels that enter the harbour is 1197, and the aggregate tonnage 28,836. Population in 1881, 14,014.

**Supplies** of all kinds are abundant, and water is led down to the quayside.

**PIERS and LIGHTS.**—Whitby harbour is defended at its entrance by east and west piers, constructed of stone with a rubble hearting ; the latter was completed in 1814 ; and they will bear a fair comparison, both as regards appearance and strength, with any similar structures in the kingdom. Upon the west pier, which is 350 yards long, are two batteries, one for twelve and the other for eight guns ; a handsome stone light-tower, built in 1831, which

stands upon its outer end, exhibits from two hours before to two hours after high-water, or whilst there is more than  $8\frac{1}{2}$  feet water on the bar, a *fixed green* light, elevated 83 feet above the sea, and visible at the distance of 10 miles in clear weather. By day balls are hoisted upon a staff in the gallery of the lighthouse, which answer the same purpose, *one ball* denoting a depth of 8 feet, and *two balls* 12 feet on the bar. On the west pier, which is also a promenade, are gas lamps, which are occasionally lighted.

The east pier, 327 yards long, extends in a N. by W. direction from the foot of the east cliff, from which it is separated by a small opening, through which the force of the sea expends itself. This pier has been continued 325 feet in a N.N.E. direction, to reduce the width of the entrance from 290 to 160 feet, as well as to prevent the existence of an eddy which proved a serious obstacle to vessels taking the harbour. A lighthouse on the head of this pier exhibits a *fixed red* light during the same periods of tide as that upon the west pier; but the colour changes to *green* on a line a little to the northward of Whitby rock buoy, when the entrance into the harbour is between two *green* lights. The light is placed at an elevation of 54 feet above high-water, and may be seen in clear weather at the distance of 8 miles.

Coal may be obtained at Whitby, but it is not kept in stock; and there is a large iron shipbuilding yard, where repairs can be executed.

Life-Boats are kept in constant readiness on the west side of the harbour, besides the usual apparatus for saving life.

**WHITBY ROCK.**—The impediments in the approach to Whitby harbour are Uppang rocks (already noticed at page 109), and Whitby Scar and rock, lying off the east cliff.

**Buoy.**—A *black* bell buoy, with staff and globe, is moored near the outer extremity of Whitby rock, in 10 fathoms at low-water, with a red-tiled farm-house in High Whitby, over the outer part of Saltwick Nab, bearing S. by E.; and Tate-hill or Burgess pier-head, appearing midway in the harbour entrance, S. by W.  $\frac{3}{4}$  W.; Ling hill lighthouses in line, S.S.E. The south lighthouse at Ling hill open east of the north lighthouse clears the Scar. The northern light changes to *red* over and in-shore of the Scar.

The Bar is a flat ledge of shale extending across the entrance

between the piers, with more or less sand upon it, according to the prevailing winds; but since the lengthening of the east pier the shale is laid bare, and there is now generally about one foot on the bar at low-water of ordinary springs.

**Harbour.**—Whitby harbour, comprising the lower portion of the Esk, is divided into outer and inner harbours; the former, 24 acres in extent, has in it three piers or jetties, namely, Scotch-head on the west side, and Tate-hill and Fish piers on the east side; built with a view of checking the inrun of the sea, which has always been one of the most serious evils of the port. The inner harbour is double the extent of the outer one, but has in it a large mud flat of 15 acres, called the Bell, which much reduces the waterway at low-water. It is the place of refuge in stormy weather, and 250 to 300 vessels can be conveniently berthed in it, for which purpose an ample supply of moorings, buoys, and posts have been provided. The bottom in the channel of both harbours consists of gravel, mud, and shale.

The swing-bridge connecting the two parts of the town, and forming the division between the harbours, was rebuilt in 1833; it spans a clear water-way 45 feet in width, and a *red* light towards the outer harbour, and a *green* light towards the inner harbour, on either side of the bridge, mark the passage by night. The following notice respecting it has been issued by the harbour authorities, and should be carefully attended to, so as to avoid damage:—

“In dark tides a bell will be fixed on the lamp-post upon the east pillar of the bridge, which, when the passage is obstructed, will be rung, and the lamps reversed, so that the lights will not be seen below bridge. In this case no pilot, or other person having charge of a vessel, must attempt to approach the bridge from below, until the lamps are again reversed, the lights from them shown, and the bell rung a second time to show that the passage is clear.

“The same signals will be made to vessels approaching the bridge from the inner harbour, in case of obstruction.”

Each vessel passing through the bridge passage is subject to a charge of 1s. 6d.

During springs, vessels drawing from 15 to 16 feet may enter Whitby outer harbour, and those of 12 feet draught during neaps. The depth through the bridge passage into the inner harbour is only one foot less.

**River Esk** extends 16 miles above Whitby harbour, but as it

drains a hilly country, the freshets discharged by it are often sudden and heavy, running through the bridge passage and between the piers at the rate of 5 miles an hour. In dry weather the outward motion of the stream is scarcely perceptible. The tidal character of the river has been greatly curtailed by a dam at Ruswarp mill,  $2\frac{1}{2}$  miles within the bar ; the tide rises during springs 3 or 4 feet at the dam, but does not extend beyond it, and the scour through the harbour is thus rendered nearly entirely dependent upon the land floods.

**Pilots.**—There are eleven pilots, under a master, and they may always be obtained in moderate weather.

**DIRECTIONS.**—If approaching Whitby harbour from the northward, the marks for clearing Uppang rocks, given on page 110, must be attended to ; if approaching from the south-eastward, Whitby rock will be in the way, and is cleared, passing to the eastward, by keeping the North Cheek of Robin Hood bay open of High Whitby, bearing S. by E.  $\frac{3}{4}$  E. ; and passing to the north-westward by keeping Larpool house, standing amidst wood above the vale of Esk, over the entrance to the harbour, S.S.W.

Should boats not venture off, a vessel may safely run for the harbour if the balls are hoisted on the flagstaff at the west pier lighthouse ; but if a fire is lighted on the West pier-head, it is to be understood that the harbour should not be attempted.

Small vessels, of 10 feet draught, in winds from between S.S.E. and East, sometimes pass through the narrow sledway between Whitby rock and Scar, in order to avoid missing the entrance to the harbour ; but this course never should be attempted except by those well acquainted with the locality, as no marks can be given for it which a stranger would be able to recognise.

The entrance to the harbour must be kept bearing from S.  $\frac{3}{4}$  W. to S. by W.  $\frac{3}{4}$  W. while approaching it, and, in entering, the East pier must be kept close-to, as the deepest water is upon that side. The channel within the entrance leads a little way to the eastward, and lies midway between Scotch-head and Tate-hill pier ; it then follows the face of the quay on the west side, where the vessel's way must be checked ; but if she has to enter the inner harbour, keep the sail set, proceed on, and the bridge will be opened.

Vessels waiting tide to enter the harbour usually anchor in Sandsend bay with north-westerly winds ; but in Whitby road, between Uppang rocks and Whitby rock, in those from south-eastward, with the West



pier lighthouse bearing from S.  $\frac{1}{4}$  E. to S.  $\frac{1}{4}$  W., in 8 fathoms, mud.

**By Night**, approaching from the southward, keep the southern Ling hill light open of the northern one, bearing S. by E.  $\frac{1}{4}$  E., and then close the West pier light on a S.  $\frac{3}{4}$  W. or S. by W.  $\frac{3}{4}$  W. bearing, and having entered, proceed as before directed, and attend to the signals made at the bridge.

**CAUTION.**—It is necessary to remember while closing Whitby harbour, that the flood stream sets strongly to the eastward across Whitby rock, except when the sea breaks heavily upon it; then there is but little set through Whitby road.

Also, Whitby harbour should never be attempted in gales from North to N.E., for the sea then breaks a long way off shore, and renders the approach dangerous; under such circumstances vessels will be warned off by a lighted barrel on the West pier, but if forced to run in they will be directed by signals from the West pier-head.

**TIDES.**—It is high-water, full and change, at Whitby, at 3h. 45m.; springs rise 15 feet, neaps  $11\frac{1}{2}$  feet, and neaps range 8 feet.

**The COAST** from Whitby to Robin Hood bay consists of high dark-coloured cliffs, occasionally tinged with red, and the low black point, Saltwick Nab, projects beyond the general line.

**HIGH WHITBY or LING HILL LIGHTS.**—Two octagonal white lighthouses stand near Ling hill, S.S.E. and N.N.W., 258 yards from each other. They exhibit *fixed white* lights of the first order, each placed at an elevation of 240 feet above high-water, and visible in clear weather at a distance of about 23 miles from N. by W.  $\frac{3}{4}$  W. round westerly to S.S.E.  $\frac{3}{4}$  E. The northern light changes to *red* over and inshore of Whitby Scar. It is in contemplation to discontinue one of these lights and to alter the character of the other.

**ROBIN HOOD BAY.**—The North and South Cheeks of Robin Hood bay are bold headlands. Near to the brink of the latter stands the mansion of Raven hall, while the village, chiefly inhabited by fishermen, is perched upon the face of the cliff in the north-west corner of the bay. The shore is divided between cliff and grassy bank, broken here and there by deep gullies or becks, and behind,

the ground, which is highly cultivated, rises like an amphitheatre, and completes a fine picture of coast scenery.

**Anchorage.**—Ledges skirt the shores of the bay, and the clear space is very limited ; but there is anchorage under the North Cheek with the wind as far to the northward as N.W., and under the South Cheek with winds to the westward of S.W., but neither position can be recommended, except for temporary purposes in summer.

**A Life-Boat** is stationed here ; there are also rockets and lines for saving life.

**The COAST.**—From Robin Hood bay high cliffs continue for  $3\frac{1}{2}$  miles to Haiburn wick, a slight indent at the mouth of a wooded vale, and then they decline in height considerably to Cloughton wick, another indent, rather more marked than the former one. From the cliff at Hundle point the coast continues of the same character, but gradually decreases in height towards Scarborough, and is backed a few miles inland by the high ridges of Silpho Suffield, and Seamer.

**Rockets** and lines are kept at Burniston in case of wreck.

The whole shore from Whitby to Scarborough is generally foul for one-quarter of a mile off, but at Robin Hood bay and Scalby Nab for double that distance ; when to the southward of Cloughton wick, Scarborough castle should be kept to the westward of S. by W., in order to avoid the foul ground from Scalby Nab.

**SCARBOROUGH** derives its name from the Saxon words “Scar” (rock) and “burgh” (fortification), and the castle of Scarborough, crowning its noble promontory, and commanding the town, is one of the most striking objects on the Yorkshire coast. The south part of the deep bay to the south-westward of the castle is bordered by steep grassy slopes with rocky ledges in front, but in the northern portion of the bay the foreshore is a smooth sand upwards of 300 yards broad at low-water ; within it the land rises with a steep ascent, and upon this slope stands the town in the form of an amphitheatre, its chief object being the ancient church of St. Mary. standing on the summit of a ridge near the castle. Taking into view the elegant new town, the bold hill, Oliver mount (493 feet) overlooking it, its castle-crowned rock, the beauty of the surrounding scenery, and the table-land of the wolds bounding the prospect in the rear, Scarborough, as to situation and appearance has no rival

on the north-eastern coast. The town, which partly owes its prosperity to this circumstance, also possesses great advantages as a watering-place, and is frequented by numerous visitors. A chalybeate spring to the south of the town is connected to it by a handsome bridge, which, with the large Cliff hotel near it, are prominent objects from the bay. A branch of the North-Eastern railway connects Scarborough with York and Hull.

A promenade pier, on iron piles, extends 1,000 feet out from high-water mark about the middle of the north bay, having its head in a depth of 10 feet at low-water spring tides.

The shipping trade of Scarborough has declined of late years, from the competition of the railway, and other causes. It now consists of a limited import of coal, and of timber from the Baltic and America, and there is also a general exchange with other ports. The long-line, trawling, and herring fisheries are carried on to a considerable extent in a superior class of steam and sailing vessels, many of them of 75 tons. Water is led down to the harbour, and may be obtained at a reasonable charge. All other supplies are abundant. There is no patent slip here, but there is a dry dock equal to the repair of vessels of 250 tons, also a floating dock and gridiron. 172 vessels, of 20,223 tons register, belonged to the port on the 1st January 1881, and the arrivals in 1880 were 382 sail, besides fishing vessels. Population in 1881, 30,484.

**Harbours.**—The protection afforded by Scarborough rock in gales from the northward must early have recommended its vicinity as a fit site for a harbour, and Scarborough has possessed one for several centuries. The present harbour is the result of many alterations and additions, and it is, as a whole, well designed for protection. It is formed by the East, Old or Vincent, and West piers, enclosing two independent harbours; the Outer, of  $5\frac{1}{2}$  acres, and the Inner, of 9 acres. The bottom throughout is fine sand, and they both dry at low-water. The direction inwards and width of the entrances are as follows:—Outer harbour, boom entrance, N.E.  $\frac{3}{4}$  E., 33 feet; and bridge entrance, E. by S.  $\frac{3}{4}$  S., 33 feet: Inner harbour, N.E.  $\frac{1}{4}$  N., 100 feet. Vessels drawing 12 feet can enter and be berthed during springs, and those of 9 feet at neaps.

The harbours are much incommoded with silt, for the tidal stream which sweeps round the bay from south to north carries the lighter particles from off the shore, and deposits them in the still water of the



harbours. This eddy begins one hour before high-water upon the shore, and continues until two hours after low-water; in strong south-easterly winds, however, it sets constantly past the harbour's mouth, and increases the evil.\*

**LIGHT.**—A neat lighthouse and attached residence stand upon Vincent pier; the light is *fixed* and *white*, except in the direction of the entrance of the harbour, when it shows *red*; and is exhibited while there is 12 feet water at Vincent pier-head, 9 feet at the entrance to the Outer harbour, and  $8\frac{1}{2}$  feet at the entrance to the Inner harbour. It is 58 feet above high-water, and may be seen in clear weather at the distance of 13 miles. By day a *white* skeleton ball is hoisted upon the lighthouse flagstaff to indicate the above depths.

**A Life-Boat**, and the usual apparatus for saving life, are kept at Scarborough.

**Ramsdale Scar.**—The foot of the castle rock is clear at one cable off, and there is nothing to obstruct the approach to the harbour except Ramsdale Scar, a flat ledge of rock opposite the Spa bridge, the outer extremity being  $1\frac{1}{2}$  cable S. by W.  $\frac{1}{4}$  W. from the lighthouse. Foul ground extends for 2 cables from the southern portion of the shore of the bay.

**DIRECTIONS.**—Scarborough harbour is easy of access in moderate weather. Vessels can sail in with winds from N.E. by N., through east and south, to W.N.W., and at other times it is usual to shoot up as closely as practicable to the lighthouse pier, let go an anchor, and then warp in; prompt assistance under efficient direction is always at hand. The precaution should be adopted to enter the harbour between half-flood and first-quarter ebb, and to have an anchor ready for letting go, and warps at hand. It is sometimes necessary to make a board in closing the entrance, so as to give Ramsdale Scar a fair berth. A steam tug belonging to the Commissioners is in attendance at tide-time for the assistance of vessels; towage outward is at the rate of 1s. per keel, and inwards by agreement.

Vessels intending to enter the harbour for refuge should, if practicable, hang off shore until the tide is well up, then, if the wind be northerly, keep just outside the broken water at the castle

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\* See Admiralty plan of Scarborough, with view, No. 1,624; scale mile=14·8 inches

foot, and run in before the sea. The back of the East pier is bold-to, and may be approached closely. In case of missing the entrance, the vessel may be beached on the sandy shore abreast, where life is always safe, and vessels generally sustain but little damage.

Scarborough bay, which is open to winds between N.N.E. and S.S.E., has a smooth bottom of fine sand over blue clay, in which the anchor holds well. The marks for the anchorage are, the keep of the castle bearing N.  $\frac{1}{4}$  W., and the Spa house from West to W. by N.  $\frac{3}{4}$  N. in 3 to 4 fathoms.

**CAUTION.**—Accidents have occurred in north-easterly gales to vessels approaching the harbour from the southward, in consequence of their standing directly across the broken water in the bay, instead of getting well to windward until abreast the harbour, and then running in before the sea. When it is unsafe to enter the harbour, vessels are warned off by a lighted barrel on the East pier, or by the *white* ball not being hoisted upon the lighthouse flagstaff at tide-time.

**TIDES.**—It is high-water, full and change, at Scarborough at 4h. 11m. ; springs rise  $15\frac{3}{4}$  feet, neaps  $12\frac{1}{2}$  feet, and neaps range  $9\frac{1}{4}$  feet.

The **COAST** from Scarborough to Filey is a continuous line of dark red cliff. Mill, or Cayton, bay, 2 miles to the southward of Scarborough, with a water-mill near its head, is sometimes used by small vessels as an anchorage in southerly winds. Red cliff, its south point, is high, and the cliffs then diminish in height to Car Naze. In working between Scarborough and Filey the shore must be given a berth of at least half a mile.

**Rockets** and lines are kept at Cayton bay in case of wreck.

**FILEY BRIG** is a remarkable rocky ledge projecting nearly half a mile to the south-eastward in continuation from Car Naze, and forms the north-eastern defence to Filey bay. The remains of a pier, which has received the name of the Spittles, runs out abruptly from the inner face of the Brig ; there is no record of the date of its construction, but it is generally supposed to have been a Roman work.

**Buoy.**—A *black* bell buoy, with staff and globe, lies in 6 fathoms, just to the southward of the outer extremity of the Brig ; with Myer's house, over the summit of the first cliff to the southward of Hunmanby

road, bearing S.W.  $\frac{1}{2}$  S. ; and the top of the first cliff to the northward of Car Naze, open to the eastward of the highest part of the Brig, N.W.  $\frac{1}{4}$  W.

Myer's house, upon the outline of the land near Speeton, kept well open to the southward of Hunmanby road, bearing S.W.  $\frac{1}{2}$  S., clears the outer point of the Brig.

**FILEY BAY**,\* within and to the south-westward of the Brig, has throughout a bottom of clay covered by sand, but foul ground begins with Scarborough rock appearing outside Car Naze. Owing to the protection afforded by the Brig, there is fair riding in the bay with the wind as far out as N.N.E., but no vessel should remain in it with the wind to the eastward of that point. With winds westward of south, there is anchorage about four miles south of Filey under the lee of Speeton cliff.

Filey bay has often been spoken of as a site for a harbour of refuge, it having, in Filey Brig, a breakwater half formed, but the bay is too shallow for any but small vessels.

**TIDES**.—It is high-water, full and change, at Filey bay at 4h. 20m. ; springs rise 16 feet, neaps  $12\frac{1}{2}$  feet, and neaps range 9 feet.

**Filey**.—The town of Filey stands upon the summit of the bank at the head of the bay ; it is a favourite bathing-place, and, like Scarborough, is rapidly increasing in size and importance. A branch of the North-Eastern railway connects it with the latter place, and with York and Hull. The church, standing to the eastward of the town, shows prominently from the sea. Population in 1881, 2,337.

**A Life-Boat** is stationed at Filey, where are also rockets, lines, &c., for effecting communication with stranded vessels.

**Water**.—There is a spring of excellent water in the dell beneath Filey church, where boats may water with small casks and a hose.

**The COAST**, fronted by a sandy strand, is a steep grassy slope to Speeton, where it rises into high cliffs of chalk ; Hunmanby, Cross, and Speeton windmills being prominent objects on the background. From Speeton to Flamborough head the cliffs continue of the same

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\* See Admiralty plan of Filey bay, No. 1,720 ; scale, mile = 3·0 inches.



character, and are nearly perpendicular, but a small break occurs at North Sea bay, which is used as a landing-place for cobbles in southerly winds, and upwards of a hundred may be seen at times hauled up upon the slope in stormy weather. Many caves and detached masses have been formed by the constant chafing of the sea, but the base of the cliff is generally free from outlying dangers. Beyond North Sea bay, the coast, again increasing in height, terminates abruptly to the south-eastward in the noble promontory, Flamborough head.

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## CHAPTER IV

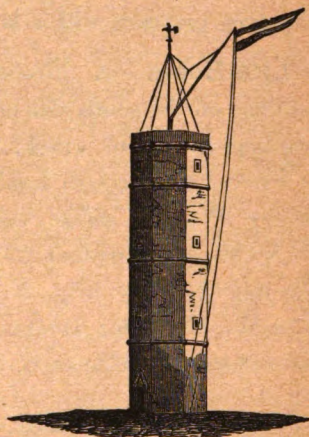
## FLAMBOROUGH HEAD TO THE HUMBER.

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Variation,  $17^{\circ} 40'$  to  $17^{\circ} 20'$  West in 1889.

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**FLAMBOROUGH HEAD**, a perpendicular cliff of white chalk from 120 to 130 feet high, is supposed to have derived its name from a flame exhibited from a beacon tower to direct the mariner. This conjecture appears to be well founded, as the head is represented with a flame upon it in all ancient charts, and an octagonal tower 74 feet high, of undoubted antiquity, still stands upon its highest part, N.W.  $\frac{3}{4}$  N. one-third of a mile from the present lighthouse. It is the extreme eastern termination of the chalk in England, across which the formation extends in masses of greater or less width until it terminates in the cliffs of Beer, in Devonshire.



Flamborough old tower.

The north side of the headland is the breeding-place of numerous sea fowls, especially gulls, which birds are far more common, on the East coast, to the north of Flamborough head than to the south of it.

The boldness of this headland, its freedom from danger, and the excellent light exhibited from its cliffs makes it the common point of arrival and departure for all vessels passing to the northward or southward along the eastern coast,\* as well as for those sailing between the Humber and the Baltic.

**Signal Station.**—From a flagstaff erected upon the old tower communications are kept up with passing vessels by signals.†

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\* See Admiralty chart of east coast of England, sheet V., Trusthorpe to Flamborough head, with views, No. 1,190; scale, mile = 0.5 inch, which chart will shortly be superseded by another of Flamborough head to Blakeney.

† At Flamborough head, and all the other signal stations the *International (Commercial) Code* is the only code recognised, and vessels of any nation which make their names known by this code in passing the stations will be promptly reported in the *Shipping and Mercantile Gazette*, and to the owners, if required.



**LIGHT.**—Between 1770 and 1806 the number of vessels lost in the vicinity proved the necessity for marking the head more distinctly; accordingly, the present lighthouse was erected over the south side of Silex bay, and one-quarter of a mile from the extremity of the head. The light, which was first exhibited on the 6th December 1806, *revolves every half-minute*, showing two *white* faces and one *red* alternately. When the distance is too great to distinguish the *red* light, a bright face will consequently appear at *intervals of a half and one minute* alternately; the light, which is elevated 214 feet above high-water, is visible at the distance of 21 miles in clear weather.

**Fog Signal.**—During thick or foggy weather a rocket is discharged *every ten minutes*, which, on reaching the height of about 600 feet, explodes with a loud report.

**Life-Boats.**—A life-boat is stationed on the north side, and another on the south side of Flamborough head, and rockets and lines are kept in case of wreck.

From Flamborough head, the Longstone light, Farn islands, bears N. by W. 109 miles, the North Cheek of Robin Hood bay N. by W.  $\frac{3}{4}$  W., distant 25 miles; Scarborough castle, N.N.W.  $\frac{1}{2}$  W., 15 miles; Filey brig, N.N.W.  $\frac{1}{2}$  W.,  $8\frac{1}{2}$  miles; Kilnsea beacon, S.  $\frac{1}{4}$  W., 30 miles; Dudgeon light-vessel, S. by E.  $\frac{1}{2}$  E., 64 miles; and Cromer lighthouse, S. by E.  $\frac{1}{2}$  E., 87 miles.

**Flamborough Steel.**—Silex bay, near the lighthouse, is but an indifferent landing-place, except at high-water in off-shore winds, and the stores for the lighthouse are usually conveyed by land from Bridlington. Flamborough ledge or steel, as it is commonly termed, projects south-easterly from the head for 2 cables, and is much in the way of vessels rounding the head; but it will be avoided by keeping the upper portion of the lighthouse well in sight above the land, or by giving the shore a berth of one-quarter of a mile.

From the head westward to as far as Sewerby, the coast continues to be limestone cliffs, fronted by a flat rocky foreshore, but a distance of 3 cables will clear it all. South Sea bay is a score, or break in the cliff, to the southward of the village of Flamborough, and is used by the fishermen as a landing-place in northerly winds. Sewerby hall, a handsome mansion surrounded by wood, stands  $1\frac{1}{2}$  mile to the westward of it, and the cliff in front, changing from limestone to clay, gradually decreases in height towards Bridlington quay.

**SMITHIC SHOAL**, occupying a large portion of Bridlington bay, has a surface of sand, covering, it is said, a mass of limestone. Its north-east extremity bears S.S.W.  $\frac{1}{2}$  W. distant  $1\frac{1}{2}$  mile from Flamborough head lighthouse, and near this end is the highest part of the shoal, with only 10 feet water upon it. From this point, two shallow arms, with 2 and 3 fathoms over them, extend, the outer in a south-westerly direction for 3 miles, and the inner one W. by S.  $\frac{1}{2}$  S. for  $3\frac{3}{4}$  miles; the space between these projections, as well as that between the shoal and the shore, has a depth of only  $3\frac{1}{2}$  or 4 fathoms, but there is 6 fathoms between the north side of the shoal and the main.

**BUOYS.—North Smithic.**—For the guidance of vessels rounding Flamborough head and entering Bridlington bay, a spherical buoy, with *red and white horizontal stripes*, has been placed at the north-east extremity of the Smithic, in  $4\frac{1}{2}$  fathoms at low-water; with Flamborough old tower, open to the westward of Gray's farm, bearing N.N.E.; and the southernmost windmill at Bridlington quay, in line with a white house, W. by N.; Flamborough head lighthouse, N.N.E. easterly, distant  $1\frac{1}{2}$  mile; and Bridlington pierhead, W.  $\frac{1}{2}$  N.,  $3\frac{1}{2}$  miles.

**South Smithic.**—A *red* conical buoy lies in 4 fathoms at low-water at the south-east end of the outer arm of the shoal; with Flamborough new mill, touching the north end of a hedgerow, bearing E. by E.  $\frac{7}{8}$  E.; Carnaby temple, in line with a clump of trees near the west end of a wood, N.W.  $\frac{1}{2}$  W.; and Bridlington church, N.W. by N., distant  $4\frac{1}{2}$  miles.

**BRIDLINGTON BAY**, a well-known roadstead, is to the westward of Flamborough head, and assuming its outer limit to be a line drawn from the head to Ulrome, it is 8 miles broad and 2 miles deep. To the westward of Sewerby the shore is clean, and anchorage may be taken up in any part of the bay between the north side of the Smithic and the shore, but the best position is with Sewerby hall bearing N.  $\frac{1}{4}$  W., and Bridlington piers from W.  $\frac{1}{4}$  S. to W. by N.  $\frac{3}{4}$  N., in  $3\frac{1}{2}$  fathoms at low-water. Here there is a fair protection from north-easterly gales, but with the wind more easterly no vessel should remain in the bay unless she be well found in ground-tackling, when it is very possible to weather the gale out; indeed, vessels frequently do so, owing to the protection afforded by the Smithic.

It is, however, the more prudent course under such circumstances to trip and run to the Humber.

A proposal to convert Bridlington bay into a harbour of refuge by constructing a breakwater upon the Smithic has been advocated; and considering the eligibility of the site, the number of vessels constantly passing, the interests of the fishing industry in the North Sea, and the difficulty often experienced in making the Humber in easterly gales, the establishment of such a work would be advantageous; but the bay is too shallow for heavy-draught vessels, and consequently, if a breakwater were constructed, it would only afford shelter to fishing boats and coasters.

**DIRECTIONS.**—The north-east Smithic buoy sufficiently marks the north channel into Bridlington bay, but should the buoy be out of position, then Flamborough old tower, kept open to the eastward of Gray's farm, bearing N.  $\frac{1}{4}$  E.; or Flamborough head lighthouse, kept to the northward of N. by E.  $\frac{1}{4}$  E., will clear the north-east end of the Smithic. Sewerby hall is now so covered in by wood as to be nearly useless as a sea-mark, but a building named Carnaby Temple, upon the outline of the hill to the westward of Bridlington, kept in line with the northernmost windmill at Bridlington quay, bearing W. by N.  $\frac{1}{8}$  N., will lead through in the fair-way between the Smithic and the shore. Should this mark be obscured, or not recognized, give the shore a berth of half a mile. When the lighthouse upon the head has been brought to the eastward of N.E.  $\frac{1}{4}$  N., the north-east end of the Smithic will have been passed, and a more westerly course must be shaped for the anchorage in the bay.

To pass to the southward of the Smithic, keep Auburn farm bearing N.W. by W.  $\frac{1}{4}$  W. (this farm is whitewashed, and has a single chimney in the centre of a dark-coloured roof), and when Bridlington pier-heads bear N. by E.  $\frac{1}{4}$  E., proceed with them so until Auburn bears W. by S.  $\frac{1}{4}$  S.; the west tail of the Smithic will then have been cleared, and a more easterly course will lead to the anchorage.

**BRIDLINGTON**, or Burlington, with its venerable Priory church, is one mile back from the coast, but a suburb named Bridlington quay stands on the shore abreast, and has a small tide-harbour. Bridlington quay, composed of houses of a superior description, a terrace on its north-east side being the most noteworthy object, is much resorted to for sea-bathing. Both places have a number of windmills about them.



**Harbour.**—A harbour has existed at Bridlington quay from a very early period, and its maintenance being considered indispensable for the shelter of vessels embayed to the southward of Flamborough head, it derived the advantage of a passing toll for upwards of a century and a half. The harbour formerly contained  $5\frac{1}{2}$  acres, enclosed by north and south, or, more properly speaking, east and south piers; the width of the entrance being 60 feet, and the course in N.  $\frac{3}{4}$  E.; but as a heavy range was thrown in by on-shore gales, the harbour was enlarged in 1842-3 to 12 acres, by the construction of a new south pier. The east pier has also been extended 100 feet to the south-west to check the in-run of the sea during south-easterly winds, but the direction of the entrance having been thereby altered has rendered entry more difficult. The entrance is 90 feet wide. The bottom of the harbour throughout is a stiff clay, with a coating of sand and silt, and it dries at low-water springs, as well as the shore for some distance outside the pier-heads. At high-water springs there is 14 feet depth between the pier-heads, and from 4 to 6 feet less over the harbour. The average number of vessels entering the harbour is 190 (excluding fishing boats), of 9,000 aggregate tons.

**LIGHT.**—A *fixed red* light is shown from the head of the east pier, at 24 feet above high-water, while there is a depth of 9 feet in the entrance of the harbour, and a *red* flag by day signifies the same fact. If the light be not shown at tide-time, it is to be understood that from a press of shipping, or other cause, the harbour is not available. By day, the like information is conveyed by a *white* flag with a *black* ball in the field, hoisted below the tidal flag.

**CAUTION.**—In north-easterly gales, with the wind inclined to come more easterly, it is prudent for vessels riding in Bridlington bay to go to the Humber, as before directed, or to enter the harbour during the last-quarter flood. The mistake is often made of waiting until after high-water, and vessels have consequently taken the ground and received much damage.

**TIDES.**—It is high-water, full and change, at Bridlington quay at 4h. 39m.; springs rise 16 feet, neaps 12 feet, and neaps range 8 feet.

**Signal Station.**—Here is a signal-station, with which passing vessels may communicate. See foot note, page 121.

A branch of the North-Eastern railway connects Bridlington with Hull, Filey, Scarborough, and York.

The trade of Bridlington is very limited, and confined to a small import of coal, and an exchange with London and other ports.

**Life-Boats.**—Two life-boats are kept in readiness in or near the harbour, with the usual life-saving apparatus.

**Supplies.**—Small supplies of coal can be procured, and vessels coaled either from boats or alongside the pier ; a plentiful supply of good water may be obtained from the stream running through the harbour, or from a spring upon the side of the latter. All other supplies are abundant.

Population, 8,363 in 1881.

**The COAST** of Holderness from Bridlington to Kilnsea, near the mouth of the Humber, is free from danger, and is composed of cliffs of dark-coloured clay from 20 to 80 feet in height. No other portion of the eastern coast suffers so much from inroads of the sea ; destruction of land once fertile and populous is the melancholy characteristic of the whole coast from Bridlington to Spurn point ; whole villages have been swept away ; their churches and landmarks have gone with them ; and those still standing near the shore await a similar tardy but certain fate. It has been computed from trustworthy observations that the whole extent of coast from Bridlington to Spurn retires from this cause 10 feet annually, representing a gross weight of four million tons of soil. At this rate the coast is computed to have receded one and a half miles since the Norman conquest.

The back country is low, and there are not many features by which one portion of coast may be distinguished from another, but the following is a running description of the objects as they occur :—

Cliff, 30 feet high, extends from Bridlington to Auburn, at which place is seen the last house of a village which, with this exception, has been washed away by the sea ; the height then is 15 or 20 feet to Ulrome coast-guard station, and 30 and 40 feet thence to Hornsea Gap, which is the first break that occurs. In these cliffs elephants' tusks have been found. In the foregoing tract of coast several windmills and farm-houses are prominent, and the low square towers of the churches of Ulrome and Skipsea appear in the midst of trees, the latter with a dark-coloured fanless mill north-east of it ; two mills near Atwick and Hornsea are also conspicuous.

**Life-Boat.**—A life-boat is stationed at Barmston.

**A Rocket** apparatus is placed at Ulrome.

**HORNSEA** village, situated low and surrounded by trees, is half a mile from the coast, and its fine large Gothic church, which was deprived of its spire by a hurricane, is a conspicuous object from the offing. Hornsea is much frequented as a bathing-place, and it has also a chalybeate spring. An hotel and lodging houses for the accommodation of visitors, and coast-guard and railway stations, stand near the shore.\* The sea, which is said to have been in former times 10 miles distant, is still making great ravages, and not many years ago a part of the village, named Hornsea Beck, was swept away.

**LIGHTS.**—From the end of a wrecked pier two *white* lights are shown vertically.

**A Life-Boat**, rockets, &c. are at Hornsea.

Cliff appears again a little to the southward of Hornsea coast-guard station, and averages 40 to 60 feet in height to the next break at Sand-le-mere.

**MAPPLETON** church stands in a commanding position close to the cliff, and, having lately been surmounted by a spire, is a valuable sea-mark, as it serves to distinguish the portion of coast on which it stands. Bunker hill, whatever it may have been formerly, can no longer be considered a hill, as its summit is scarcely 20 feet above the general level of the cliff; a dark coloured farm-house with out-buildings stands at its back, and there are several other farm-houses to the southward, near the cliff.

**GRIMSTONE GARTH**, though occupying one of the most elevated sites on the Holderness coast, is anything but a plain object from the sea. It is a castellated mansion much covered in by trees, with its highest tower terminated by a stunted spire and flag-staff. The place is noted as having been the seat of the standard-bearer of William the Conqueror. To the southward Hilston red brick tower, and small spire-church, and Tunstall tower-church, upon high ground, and then Owthorne mill, are all prominent objects.

**SAND-LE-MERE.**—At Sand-le-mere the remains of a lake occasions a break in the cliff; there is a row of coast-guard houses upon the south side of it. The next gap occurs at Withernsea, and the intermediate cliff averages from 40 to 60 feet in height.

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\* An iron pile pier extending out from Hornsea has been partly wrecked, and the fallen portion of the structure (about 210 feet), which is submerged at high tide, is marked by a *green* buoy.

**WITHERNSEA.**—Owthorne and Withernsea churches, when entire, were known by seamen as the sister churches, from their standing so close together; the former fell in 1816, and now not a vestige is left. The old church of Withernsea was taken down several centuries ago and rebuilt in its present position, till lately it was in a ruinous state and unroofed, but it has again been restored; though it stands low, it, as well as a large terrace upon the shore, is a plain object from the sea. On the coast, remains of the red deer have been found, also an old canoe made of the trunk of a tree. The spire of Patrington church, a short distance inland, is seen from every direction in the vicinity of the Humber, excepting when behind the higher land of Dimlington.

**Pier and Light.**—There is a pier at Withernsea, from the head of which a *fixed red* light is shown.

**A Life-Boat** is stationed at Withernsea; and rocket apparatus at Sand-le-Mere, Holmpton, and Easington.

**DIMLINGTON.**—South of Withernsea, cliff again occurs, which, at Out Newton, rises into the bold elevation Dimlington height, a cliff of boulder clay and pebbles, 130 feet above high-water; this being a very distinct object from the offing, serves to mark the neighbourhood of the mouth of the Humber.

From Dimlington the cliffs decline towards Easington, the church and mill of which are both prominent.

**SOUNDINGS.**—The contour line of 10 fathoms at low water, which at Flamborough head is close to the shore, passes one mile outside the Smithic bank, and from thence is at an average distance of five miles from the shore to abreast Dimlington heights. To the eastward of Flamborough head the depth increases to 25 fathoms at four miles from the coast, and is then regular to 30 fathoms at 20 miles from the head. Outside this again the depths are somewhat irregular to the Dogger bank.

**DOGGER BANK.**—The general depths on which are from 12 to 20 fathoms, extends about 140 miles in a north-east and south-west direction, the greatest breadth being 65 miles. At its south-west end, 65 miles from Flamborough head, is an extensive patch of from 7 to 10 fathoms, which breaks heavily in gales. This, known as the south-west patch of the Dogger bank, is 35 miles long in an E.S.E. and W.N.W. direction by 10 miles in width. It lies between the parallels of  $54^{\circ} 26'$  and  $54^{\circ} 40'$  North latitude, and the meridians of



1° 35' and 2° 35' East longitude. It is a favourite resort of the Humber fishermen.

**KILNSEA.**—Beyond Easington the shore is very low to North cliff, near which Kilnsea beacon is placed. This beacon, of timber, painted *black*, is triangular, with a lozenge-shaped head, terminating in a ball, and is 67 feet high. Beyond the village of Kilnsea, and the cliff a short distance to the southward of it, the shore, skirted by low sand-hills, bends more westerly, and the Holderness coast finally ends at Spurn point, the northern boundary of the entrance to the river Humber.



Kilnsea beacon  
West (Black).

**RIVER HUMBER,\*** a common outlet for the numerous streams which collect the drainage of the greater part of Yorkshire and the mid-counties (comprising upwards of one-sixth of England), is formed by the junction of the Ouse and Trent 17 miles above Hull or 36 miles from the sea. Here the Humber is rather more than one mile wide, and after an irregular course, but mostly in an E.N.E. direction, nearly doubles its width as it reaches Hull; 2 miles farther down it turns abruptly, and runs S.S.E. for 10 miles; it then bends more easterly, and joins the sea as a stream 4 miles wide at high-water. Its name is supposed to be derived from an ancient Scythian King—Humber—drowned in the estuary.

The Humber is confined for nearly the whole of its course between low embanked lands, from which the water has been progressively excluded by the process of silting or “warping,” as it is here termed. Owing to the tortuous character of the river, and the amount of matter with which its waters are charged, the navigable tract is narrowed by numerous shoals and extensive flats, and as the tidal streams are rapid and irregular, those of springs and neaps setting in many instances in different directions, and as the low flat fore-shores offer but few objects as sea-marks, the navigation of the Humber would be extremely difficult without artificial marks; but as it is well buoyed and lighted by the Trinity House at Hull, and is now throughout regulated in accordance with the uniform system of buoyage, there is little difficulty in piloting vessels to Hull in ordinary clear weather. Above Hull the changes are so frequent that it has not been considered

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\* See Admiralty chart, River Humber, with plans of Kingston-upon-Hull and Grimsby, and views of lighthouses and beacons, No. 109; scale, mile = 1·48 inch.



necessary to publish either charts or sailing directions, as local knowledge is indispensable. The three important places on the Humber are Grimsby, Hull, and Goole.

**GRIMSBY**, a very ancient borough, the former prosperity of which is shown by its having furnished 11 ships and 170 mariners to Edward III. for the siege of Calais, stands upon the right bank of the Humber, 13 miles below Hull, and 6 miles above Spurn point. Like many other places on the East Coast its harbour suffered from neglect and gradually became choked by sand ; decay followed, and its trade became absorbed by Hull ; but since 1801, when a dock was constructed at the mouth of Laceby beck, and connected with the navigation of the Humber by a straight outfall, the trade of the port has steadily increased.

The chief article of import is timber ; there are also imports of raw cotton, corn, linseed, cattle, and sundries. Machinery is extensively exported, besides coal, manufactured bale goods, and general merchandise ; the export of coal (principally to the Continent) in 1880 amounted to 393,875 tons. There is a stated periodical trade by steamers with Cronstadt, Hamburg, Rotterdam, and Dieppe. The registered shipping of the port on the 1st January, 1881, consisted of 659 vessels, of 49,487 tons. The arrivals in 1886 were : Foreign vessels 1,577, of 672,043 tons register ; coasting vessels 2,362, of 118,354 tons register ; fishing vessels 19,106, of 955,108 tons register ; or a total of 23,045 vessels, of 1,745,505 tons register. The aggregate value of the exports was, in 1886, £7,153,150. Population, 29,682 in 1881.

**Supplies.**—Coal can be obtained readily and cheaply, and vessels coaled in the docks with facility. Vessels and machinery can be repaired expeditiously ; water and provisions procured in any quantities at short notice.

**Docks.**—The principal features of Grimsby are the Royal and Alexandra docks, excavated by the Manchester, Sheffield, and Lincolnshire railway company, between 1847 and 1880. The object of these important works was the establishment of a great commercial port near the mouth of the Humber. Locks connect the Royal dock with a tidal basin formed by piers of open piling. The Alexandra dock is connected to the Royal dock by the Union dock, and has besides an outlet of its own into the Humber. The tide, however, does not reach the gates of the Alexandra lock until it has flowed two feet in the

Humber. N.N.E. winds cause the highest tides at Grimsby, and those from N.N.W. the most sea, but the swell never prevents the dock gates being opened. The principal dimensions of these extensive works are as follows :—

	Area in acres.	Length in feet.	Breadth in feet.	Depth over sill at high- water.	Breadth of entrance.	Locks.	
						Length.	Breadth.
Royal dock - -	25	2,328	501	26	{ 70 45	300 200	70 45
Alexandra dock -	48	6,300	varies	18	{ 37 30	145 100	35 20
Fish dock - -	23	—	—	20	{ 20 250	140 —	30 —
Tidal basin - -	14	—	—	26	45	230	45
Union dock - -	1½	558	96	21			

On the mass of solid masonry between the locks entering the Royal dock a lofty square brick tower has been erected, for the purpose of giving the necessary height to a reservoir of water for working the lock-gates by hydraulic pressure; the whole of the cranes, &c., along the sides of the dock are also worked by the same simple machinery. The tower, which is a striking object from the offing abreast the Humber, is surmounted by an octagonal lantern, the top of which is 310 feet above the base of the building. The entrance to the locks is kept open by dredging and occasional sluicing. The Alexandra dock is partly fed by extensive inland drains, from which there is very little deposit.

**Lights.**—A *red* light is shown all night at the head of each pier of the tidal basin.

**Signals.**—The following code of signals has been established at Great Grimsby docks :—

1. Royal dock.—Tide signals by day :—

- (a.) A *red* flag is hoisted on the east side of the locks when there is 12 feet of water on the sill, and kept flying until there is less than 12 feet.
- (b.) When there are 16 feet over the sill a *black ball* is hoisted on the west flag staff.
- (c.) When there are 20 feet 2 *black balls* are hoisted on the west flag staff.
- (d.) When there are 24 feet or more 3 *black balls* are hoisted

## 2. Lock gate signals.

- (a.) Large lock.—When the outer gates are opened a *green flag* will be shown on the flag staff on the west side of the lock. When the lock is level and all gates open *two green flags* are exhibited.
- (b.) Small lock.—When the outer gates are opened a *green flag* is exhibited at the flag staff on the east side of the lock under the *red flag*; when the lock is level and all gates open *two green flags* are shown under the *red flag*.

NOTE.—During the time both locks are closed the *red flag* is hauled down. When vessels cannot enter the basin a ball is hoisted at the flag staff on the west side of the large lockpit.

## 3. Royal Dock.—Night signals :—

- (a.) When the locks are closed 3 *bright* lights are shown, one in the centre between the locks, one in the east of the small lock, and one west of large lock.
- (b.) When the outer gates of the large lock are open the bright light on its west side is changed to *green*. When the outer gates of the small lock are opened the bright light on its east side is changed to *green*.
- (c.) When either lock is level, with both gates opened, the bright lights on each side are changed to *green*; when both locks are open and level all three lights are *green*.

NOTE.—During the time both locks are closed the *red* light on the flagstaff on the east side of the locks will not be shown. When vessels are not to enter a *red* light will be shown at the top of the flagstaff on the west side of the large lockpit.

## 4. Alexandra dock.—Signals by day :—

- (a.) A *red* flag is hoisted on the flag staff on the west side of the lock when there are 8 feet over the sill, and is kept flying until the water has fallen again to 9 feet on the sill.
- (b.) When there are 12 feet on the sill a ball is hoisted in addition to the flag; when there are 16 feet two balls; and when 18 feet three balls.
- (c.) When the lock is level and all gates open a *green* flag is substituted for the *red* flag.

- (d.) During the sluicing of the outfall, and at such times as the dock is obstructed, a *blue* flag will be exhibited. Vessels are then not to approach under any circumstances.

5. Alexandra dock.—Night signals :—

- (a.) A *red* light is exhibited from the flag staff when there are 8 feet over the sill with the rising tide, and is extinguished when the tide has fallen to 9 feet on the sill with the ebb.
- (b.) With 12 feet water over the sill a *bright* light is shown in addition to the *red* light ; with 16 feet, *two bright* lights ; and with 18 feet, *three bright* lights, vertically.
- (c.) When the lock is level and all gates open, a *green* light is substituted for the *red* light.

NOTE.—The hours of working the Alexandra dock gates are from 5 a.m. to 7 p.m. from the 1st April to 1st October ; and from 7 a.m. to 5 p.m. from 1st October to 1st April.

6. Code of day and night signals for the Fish dock :—

- (a.) During the day *one ball* is hoisted at the flagstaff at the dock entrance when vessels may enter. When the dock is obstructed and vessels are *not* to enter, *2 balls* are exhibited.
- (b.) During the night, *one red* light is exhibited from the same flagstaff, when vessels may enter. When the dock is obstructed and vessels are *not* to enter, *two red* lights are shown.

NOTE.—Vessels wishing to enter the Royal dock exhibit a flag at half mast. Vessels for the Alexandra dock a flag at the masthead.

**Fog Signal.**—A bell is rung at the north pier-head in fogs.

Along the sides of the docks are extensive warehouses, connected by branches with the main line of railway, to the great convenience of vessels loading or discharging cargoes, while there is every facility for coaling steam vessels.

For the accommodation of the fishing trade, which is very extensive, there is a fishery dock of 12 acres, to which an addition of 11 acres was made in 1877, making a total of 23 acres. On one side of the dock is a spacious landing-stage and fish market, 300 feet long, and provided with ample siding accommodation ; there are also ice and curing houses. The number of smacks registered at Grimsby in 1878 was 503, with a tonnage of 29,771. In 1877, the quantity of fish sent by rail to all parts of the country was 44,376 tons.

**Graving Docks.**—There are three graving docks, one of which is capable of receiving ships of a large class; the others are for fishing craft. Their dimensions are as follows:—

	No. 1 Graving Dock.	No. 2 Graving Dock.	No. 3 Graving Dock.
Length from gates to head, feet	- 400	400	—
„ on blocks, feet	- - - 350	390	143
Width of entrance, feet	- - - 70	30	—
Average depth on sill at high-water, feet	20	18½	10½

There is in addition a patent slip and gridiron.

**Signal Station.**—At Grimsby is a signal station with which passing vessels may communicate. *See foot note, page 121.*

**Lifeboat.**—A lifeboat is stationed at Grimsby.

**KINGSTON-UPON-HULL**, situated at the junction of the river Hull with the Humber, 19 miles above Spurn point, and celebrated as a harbour for shipping from an early period, is now a place of the first mercantile importance. Its original Scandinavian name was Wyke; it was first called Hull in the time of Richard I., and at length received the name of King's Town from Edward I. in 1299.

The town stands upon a low level, and the southern face, which skirts the Humber is about 2 miles long. The tower of the church of Holy Trinity, the towers and spires of other churches, numerous factory chimneys, and windmills on the east side of the town, and the dome of the gaol, are the chief objects which are seen in the approach from below.

The rivers Hull, Derwent, Ouse, and Trent connect Hull with all the interior navigation of the west; while the Hull and Selby (now North-Eastern) railway, formed in 1840, joins it to the great lines traversing the inland districts, and hence with the principal manufacturing and commercial towns of the kingdom. Hull is the chief inlet for corn, linseed, cotton, rapeseed, timber, wool, flax, hemp, iron, madder, and rags; it also exports manufactured produce to the Low Countries, France, Germany, Denmark, and the whole of the north of Europe, and to these combined circumstances is owing its aspect of commercial bustle and prosperity.

From Hull the first ships engaged in the Greenland fishery were sent, as early as 1598, and it was a Hull whaler which in 1833 saved the lives of Sir John Ross and his companions, who had been four

years in the Arctic regions. This industry is now no longer pursued from the Humber.

Ship-building, both in wood and iron, is carried on. The whole trade of the port in 1880 consisted of the arrival of 5,938 vessels, with a total of 2,346,788 tons; of these 3,335 vessels, of 1,648,000 tons, were from foreign ports. On the 1st of January 1881 the registered shipping of the port was 656 sailing vessels, of 46,855 tons, and 216 steamers, of 142,559 tons. Numerous whalers formerly sailed from Hull, but at present this branch of industry is not prosecuted. Population, 154,250 in 1881.

Steam-vessels ply constantly to the pier at New Holland, on the opposite side of the Humber, in connection with the Manchester, Sheffield, and Lincolnshire railway; and there are river steam-vessels daily to Ferriby Sluice, Goole, Gainsborough, and Grimsby.

Vice-consuls for most foreign nations are resident.

**Supplies.**—Coals are readily obtained and vessels coaled in the docks. All other supplies are plentiful, and water may be filled by hose in several of the docks and in the ferry-boat basin. All repairs to hull and machinery executed with facility.

**Docks.\***—The town was formerly encircled by fortifications, but their site is now occupied by a chain of docks, connected at their extremities with the Hull and Humber. The Victoria dock, added to the number in 1850, was excavated out of the ground eastward of the Hull—it also communicates with both rivers. The Alexandra dock, also excavated to the eastward of Hull, was opened in 1885.

The dimensions of the various docks, &c., are given in the following table:—

	Area in acres.	Length in feet.	Breadth in feet.	Depth on sill at high- water. ft.	Width of en- trance.	Locks.	
						Length	Width.
Queen's dock - - -	10	1701	252	20½	38	121	38
Humber dock - - -	7	912	342	26½	41½	158½	41½
Prince's dock - - -	6	645	405	20½	35½	120	35½
Railway dock - - -	3	720	165	26½	42	—	42
Victoria dock - - -	20	2013	378	27½	50	121	32
„ basin - - -	3	—	—	—	—	—	—
„ half-tide - - -	—	330	345	25	60 & 32	121	60
„ dry pool - - -	—	327	138	22	45	172	45
„ timber pond - - -	25	—	—	—	—	—	—
Albert dock - - -	24½	3417	429	28½	80	320	80
Alexandra dock - - -	46¼	2301	1000	34	85	550	85
New dock - - -	10	—	—	—	—	—	—
William Wright dock -	6	1389	219	28½	—	—	—

\* Information from Dock Authorities, 1881.



The docks together embrace a water space of upwards of 135 acres, exclusive of timber ponds, which are nearly 25 acres in area.

There are eleven graving docks, three of which are capable of accommodating large vessels. The largest dock is 550 feet long, with an entrance 65 feet wide and a depth of  $21\frac{1}{2}$  feet over the sill. Two of the other docks will admit ships of 1,300 tons. There are patent slips equal to vessels of 1,200 to 2,500 tons.\*

**GOOLE** is situated upon the right bank of the Ouse at the confluence of Dutch river, 10 miles above the junction of Ouse and Trent, and 27 miles above Hull. Old Goole extends irregularly along the bank of Ouse, but the new town is compact and well-built. The church, built in 1846, is a cruciform structure of the Perpendicular style, and, being surmounted by a lofty spire, is a striking object from every part of the neighbourhood.

Goole is connected by water and railway with all the chief manufacturing towns and neighbouring districts. Its principal imports are corn, oil, dyewoods, wool, and other raw products; and its exports, bale goods, machinery, stone, and coal. The declared value of the exports in 1886 was £5,058,917. Steam communication with the Continent was established as far back as the year 1833. Vessels of 17 to 18 feet draught frequent the port at springs, and those of 12 to 13 feet at neap tides.

In 1885, 2,208 vessels entered the port, of an aggregate tonnage of 511,890 tons.

There are such frequent changes in the channel of the Humber and Ouse between Hull and Goole that a description of the pilotage would only tend to mislead. For this reason, and also on account of the rapidity of the tides, the services of a pilot should always be obtained. Seven or eight steam tugs constantly ply for towage between Hull and Goole.

**Docks, &c.**—Goole, constituted a port in 1827, is the property of the Undertakers of the Aire and Calder navigation; it owes its prosperity to being the outlet to that navigation through the Knottingly and Goole canal, which was commenced in 1820 and opened in 1826. In 1829 the Undertakers entered upon the construction of a series of docks, called the Ship, Barge, and Harbour docks; in 1840 the

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\* Another slip, which is being constructed by Earle's Ship-building Company, will be capable of taking up a ship of 3,500 tons gross register, with a dead weight of 2,500 tons, in 90 minutes (October 1881).

Steam-ship dock was formed, together with a large entrance lock, and in 1848 the Railway dock was added. The docks communicate with each other and with the Ouse by three locks; first, the Steam-ship lock, 264 feet long and 58 feet wide, with  $18\frac{1}{2}$  feet over the sill at high-water springs; the Ship lock, 264 feet long by 58 feet wide, with 18 feet over the sill at high-water; and, lastly, the Barge lock, 119 feet long and 22 feet wide, with 19 feet over the sill. The aggregate area of the docks is 20 acres, and the river frontage, 1,090 feet in length, is faced with stone. There is also a graving dock, 230 feet long and 58 feet wide, with 11 feet over the sill; and a patent slip 180 feet in length for repairs; and extensive ranges of warehouses for bonded and other merchandise. The various lock-gates, cranes, &c., are worked by hydraulic power; as is also a large hoist which lifts vessels carrying 40 tons of coal out of the water, and tips their contents into ships for export. The Lancashire and Yorkshire and North-Eastern railways have branch lines to the port.

**Supplies.**—All supplies can be procured here and coal in any quantity. Repairs to ships and machinery can be executed.

**General Remarks.**—As before mentioned the shores of the Humber are low and fronted by extensive sands. The most conspicuous objects from seaward are the Spurn Point lighthouses, Kilnsea beacon, Easington church and mill, and Donna Nook beacon. Inside the estuary the Hydraulic tower at Grimsby is seen in every direction, and besides the before-mentioned objects the most conspicuous are Patrington church spire, Cleethorpe church and mills, Humberston church, and the Killingholme lights, &c.

**SPURN POINT and LIGHTS.**—Spurn point, the southern extremity of the coast of Holderness, consisting of low sand-hills from 10 to 20 feet above high-water, is well distinguished by the lighthouses which stand upon it for marking the entrance to the Humber, and for leading in a fair-way from the south-eastward. The high lighthouse is a brick tower, 112 feet high, painted dark red; the light is *occuluting* with *one* occultation of *three seconds'* duration *every half minute*, and *white*, except between the bearings N.W. by N., round northerly, to S.E. by E.  $\frac{1}{4}$  E., when it shows *red*. The former of these bearings leads a little to the north-eastward of the Sandhaile buoy, and the latter one cable north of Grimsby pier. The high light is 93 feet above high-water, and is visible at the distance of 15 miles. The low lighthouse, which is now upon the inner side



instead of the outer side of the point, as formerly, bears N.W. distant 158 yards from the high lighthouse, and shows a *fixed white* light at 54 feet above high-water, visible in clear weather 12 miles.

**Caution.**—In consequence of the encroachments of the sea having endangered the stability of the high lighthouse, mariners are warned that it may be found necessary to discontinue the exhibition of the light therefrom without an opportunity being afforded for giving due notice. In this event the point will be distinguished by the low light, which shows all round, except where obscured by the high tower.

**A Life-Boat** is maintained at Spurn point by the Hull Trinity House; the boat is moored inside the point, is always afloat, and has an efficient crew of ten men residing at the station. A watch is kept by the crew night and day for vessels in distress.

A Postal Telegraph office has been established at Spurn point.

**SPURN LIGHT VESSEL**, with *Spurn* painted on her sides, lies in the fair-way of the entrance to the Humber, and is generally called the New-sand float, from having originally been placed to mark a shoal of that name, since washed away. She is moored in  $9\frac{1}{2}$  fathoms, and, at 36 feet above the water, exhibits a *white* light *revolving every minute*, which is visible at the distance of 11 miles.

**Fog Signal.**—A powerful siren is sounded during foggy weather, giving *three blasts* in quick succession *every two minutes*, in the following manner:—a *low note* of *two seconds'* duration; silence *two seconds*; a *low note* of *two seconds'* duration; silence *two seconds*; a *high note* of *two seconds'* duration, followed by an interval of *one hundred and ten seconds*.

From the vessel, Kilnsea beacon appears midway between Easington church and mill, bearing N. by W.  $\frac{2}{3}$  W.; Spurn low lighthouse, open its breadth to the northward of the high lighthouse wall, N.W. by W.  $\frac{1}{4}$  W.; and Louth spire, open to the westward of Grainthorpe church, S.W. by W.; Flamborough head lighthouse is North, 35 miles; Banks No. 1 buoy, N. by E.  $\frac{3}{4}$  E., 1 mile; Banks No. 3 buoy, W.N.W., 3 miles; Bull Sand light-vessel, W. by N.  $\frac{1}{2}$  N.,  $4\frac{9}{10}$  miles; Chequer shoal buoy, W.  $\frac{1}{4}$  N.,  $1\frac{8}{10}$  mile; Sandhaile buoy, S.W.  $\frac{3}{4}$  S.,  $1\frac{9}{10}$  mile; Donna Nook beacon, S.W.,  $6\frac{1}{10}$  miles; and the Dudgeon light-vessel, S.E.  $\frac{3}{4}$  S., 33 miles.

**STONE BANKS**, or Binks, are connected with, and front Spurn point to the south-eastward. They are composed of shingle and sand,

and named Outer, Middle, and Inner; the Middle and Inner are partially uncovered at low-water springs. A narrow channel is at times formed between the Inner bank and Spurn point, but it is only fit for the use of boats.

**Buoys.\***—The east and south sides of the Stone banks are marked by the following buoys:—

**No. 1, Outer Bank**, the easternmost and outermost, is a *black conical* buoy with *staff and globe*, in 38 feet; with Easington church, well open to the northward of Kilnsea beacon, bearing N.N.W.  $\frac{1}{3}$  W.; and the windmills at Cleethorpe, open of Spurn point, W. by N.; Spurn high lighthouse, W. by N.  $\frac{1}{2}$  N.; and Spurn light-vessel, S. by W.  $\frac{3}{4}$  W., distant 1 mile.

**No. 2, Middle Bank**, W.  $\frac{1}{2}$  N.  $1\frac{5}{10}$  mile from Bank No. 1, is a *black conical* buoy, in 27 feet; with Dimlington height, just open to the eastward of Kilnsea beacon, bearing N.  $\frac{1}{2}$  W.; and Grimsby hydraulic tower, in line with Spurn high lighthouse, W.N.W.

**No. 3, Inner Bank**. West,  $1\frac{6}{10}$  mile from Bank No. 2, is a *black conical* buoy, in 30 feet; with Dimlington cliff, in line with Easington windmill, bearing N.  $\frac{2}{3}$  E.; and Grimsby hydraulic tower, open of Spurn point, N.W. by W.  $\frac{3}{4}$  W.; Spurn high lighthouse, N.W.  $\frac{1}{2}$  N.; and Bull light-vessel, W.  $\frac{3}{4}$  N., distant  $1\frac{1}{10}$  mile.

These buoys are all close to the Banks.

**CHEQUER SHOAL**, a patch of stony ground, half a mile in extent, with 19 feet upon it, is one mile to the southward of the Banks, and W.  $\frac{1}{2}$  N.,  $1\frac{3}{4}$  mile from Spurn light-vessel.

**Buoy**.—A *spherical* buoy, No. 1, *black and white horizontal stripes*, with *staff and diamond*, lies on its eastern side in 22 feet; with Easington windmill, midway between Easington church and Dimlington cliff, bearing N.  $\frac{1}{4}$  W.; Spurn low lighthouse, open to the westward of the high lighthouse, N.W.  $\frac{1}{2}$  N.; and Bull light-vessel, N.W. by W.  $\frac{3}{4}$  W., distant  $3\frac{2}{10}$  miles.

**CAUTION**.—Owing to the strong tides over the Chequer Shoal, which at springs runs 5 knots per hour, the buoy is sometimes washed away. Under these circumstances, if the weather is clear,

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\* The buoys of the Humber, numbered throughout, are on the uniform system of buoyage, *black* to the northward, with *black and white vertical stripes* to the southward; those on Chequer shoal and Middle grounds have *black and white horizontal stripes*.

the hydraulic tower at Grimsby, in line with the Bull light-vessel, N.W. by W.  $\frac{1}{4}$  W., will lead to the southward of the shoal, but very close to its edge; Cleethorpe church in line with the Bull light-vessel, W. by N.  $\frac{1}{2}$  N., will lead to the northward. If the weather is too misty to see these marks, the shoal may be cleared to the southward by bearings of the Bull and Spurn light-vessels—on no account having the Bull to the westward of a N.W. by W. bearing until the Spurn light-vessel bears E.N.E.; also by keeping the ship far enough to the southward to ensure that the angle subtended between the Spurn light and Kilnsea beacon shall be less than  $34^{\circ}$  W. or in very thick weather by keeping in soundings of more than 10 fathoms.

No. 3 black conical buoy in line with the extreme of the land clears the shoal on its west side.

**SANDHAILE**, an extensive sandy flat or shelf projecting from the Lincolnshire coast, forms the southern boundary of the navigation at the entrance to the Humber.

**Buoy.**—The north-east extremity is marked by an iron *can bell* buoy, No. 1, or Sandhaile, *striped vertically black and white*, with *staff and cage*, in 24 feet; with the spire of South Somercoates church, open to the southward of North Somercoates church, bearing S.W.  $\frac{1}{2}$  S.; spire of Patrington church open north-east of Spurn high lighthouse N.N.W.; Spurn light-vessel, N.E.  $\frac{3}{4}$  N.; and Bull light-vessel N.W.  $\frac{1}{2}$  W., distant  $4\frac{3}{4}$  miles.

**DONNA NOOK**, the low point of Lincolnshire bounding the outlet of the Humber to the southward, is marked by a beacon 60 feet in height, formed of wood, painted red, and of a triangular shape, surmounted by a smaller triangular head.



**The Life-Boat** stationed at this point has been very successful in saving life. A rocket apparatus is kept here.

**BULL SAND**, a short distance within Spurn point, and nearly in mid-channel of the entrance, is  $2\frac{1}{2}$  miles long in a N.W. and S.E. direction, by one mile broad. On it is one patch of 4 feet and two large patches, with 15 and 16 feet water over them, the rest of the main shoal having 3 to 5 fathoms.

**A LIGHT-VESSEL**, showing, at 21 feet above the water, a *fixed white* light, visible from a distance of 8 miles, is moored near the south-east side of the shoal in 5 fathoms. The vessel is painted red,

with the name *Bull* on her sides, and carries a globe at the mast-head. A small *white* light is exhibited from the bow, at 12 feet above the deck, for the purpose of showing in which direction the vessel is riding.

**Fog Signal.**—A bell is sounded during thick or foggy weather.

From the light-vessel, Grimsby church appears open a little to the northward of the railway station at Cleethorpe, W. by N.  $\frac{3}{4}$  N.; and the life-boatmen's houses at Spurn are in line, N.E. by E.  $\frac{1}{2}$  E.; Clee-ness buoy, N.W., distant  $2\frac{1}{2}$  miles; Spurn light-vessel, E. by S.  $\frac{1}{2}$  S.,  $4\frac{9}{10}$  miles; and Sandhaile buoy, S.E.  $\frac{1}{2}$  E.,  $4\frac{3}{4}$  miles.\*

**Buoys.**—A *can* buoy, No. 2, Bull, *striped vertically black and white*, lies in 20 feet, N.W.  $\frac{1}{2}$  W., 8 cables from the light-vessel, and close to the eastern side of the eastern shallow patch of Bull sand; with Grimsby church, open to the northward of the railway station at Cleethorpe, bearing W. by N.  $\frac{1}{2}$  N.; and a low flat wood on the outline, open its own breadth to the southward of Tetney grove, S.W.  $\frac{1}{2}$  S.

A *spar* buoy with a pole showing 8 feet above water marks the southern extreme of the northern Bull sand; it is moored in 10 feet at low water, about 30 yards south-eastward of a patch of four feet, with Spurn high lighthouse E.N.E. and Donna Nook beacon S.  $\frac{3}{4}$  E.

**TRINITY and SUNK SANDS.**—Both shores of the Humber within the entrance are skirted by extensive flats, which in some places dry out a considerable distance at low-water. Thus, nearly the whole of the extensive bight on the north shore between Spurn point and Sunk island is occupied by Trinity and Sunk sands, which together are about 6 miles long and 2 miles broad; these sands are now continuous, the old Patrington channel having disappeared.

\* The following instructions have been issued by the Trinity House at Hull to the masters and mates of the Bull sand and Middle sand light-vessels:—

In the event of the light-vessel being driven from her station, so as to make it dangerous to shipping to continue to exhibit her lights, the lights are to be discontinued, and two red lights substituted, one at the end of the davit, forward, the other on a stanchion, beside the ensign-staff; and a red flare light is to be shown every quarter of an hour during the night.

When vessels are observed from a light-vessel to be in distress, or to require assistance:—

If in the day-time, two guns are to be fired on board such light-vessel, each at an interval of five minutes, and repeated every half hour until assistance be observed approaching.

If in the night-time, two guns are to be fired on board such light-vessel at similar intervals, each followed by a white rocket thrown in the direction of the vessel in distress, and these signals are to be continued until the required assistance has been rendered.



**NORTH CHANNEL.**—Close within Spurn point, between Trinity sand and Kilnsea clays, is a small inlet one mile deep and two cables wide. Fishing smacks and other small vessels ride securely here.

**Buoys.**—The outer part of Trinity sand is marked by the following buoys :—

**No. 4, Lower Trinity,** a *black conical* buoy, lies in 27 feet, with Spurn high lighthouse, three times its breadth to the southward of the low lighthouse, bearing S.E.  $\frac{3}{4}$  E.; and Dimlington height, over the store-house upon Easington shore, N.N.E., northerly.

**No. 5, Upper Trinity** a *black conical* buoy, lies in 16 feet, with Spurn high lighthouse, open its breadth to the eastward of the low lighthouse, bearing S.E.  $\frac{1}{2}$  S.; and Easington windmill, midway between Winsett's farm and Easington church, N.E.  $\frac{1}{2}$  E.

**CLEE-NESS SAND** is an extensive flat of loose stones and shingle, which projects from the Lincolnshire shore for  $2\frac{1}{4}$  miles abreast the village of Cleethorpe.

**A Life-Boat** is stationed at Cleethorpe.

**Buoy.**—**No. 3, Clee-ness.**—This turning point in the navigation is marked by a *can* buoy, *striped vertically black and white*, with *staff and cage*, lying in 3 fathoms; with Humberston church, under the western of two distinct clumps of trees on the outline, bearing S.W.  $\frac{1}{4}$  W.; and Grimsby church, just to the westward of the eastern windmill in Grimsby marsh, W.  $\frac{1}{2}$  N.; Burcom, or No. 4 buoy, N.W. by W., distant 2 miles; and Bull light-vessel, S.E.,  $2\frac{1}{2}$  miles. There is a depth of only 8 feet a short distance within the buoy.

**MIDDLE SAND** begins 2 miles above Spurn point, and continues on for 4 miles nearly in mid-stream to abreast of Grimsby. Hawk road is between its south-east end and Spurn point, and Sunk road between its north-west end and Sunk spit. Both the height and shape of this shoal are subject to constant change; its shallow part was, when last examined in 1877, one mile long and a cable wide, with 17 feet least water. Killingholme lights in line, N.W.  $\frac{3}{4}$  W., leads south of the Middle and between it and Clee-ness sand. This sand has recently (1888) extended to the south-eastward.

**MIDDLE LIGHT-VESSEL.**—A light vessel, painted red, with a globe at the mast-head, and the name *Middle* on the sides, is moored in 4 fathoms on the north-west end of the shoal, and shows,

at 20 feet above the water, a *fixed red* light, visible from the distance of 7 miles. A small *white* light is exhibited from the bow, at 12 feet above the deck, for the purpose of showing in which direction the vessel is riding. From the light-vessel, Grimsby hydraulic tower bears W. by S.  $\frac{1}{2}$  S., and Killingholme high lighthouse appears open a little to the north-east of the south-east low lighthouse, N.W.  $\frac{1}{2}$  W.

**Buoys.—Middle, No. 3,** is a *spherical* buoy, *striped horizontally black and white*, in 18 feet, on the north-east side of the sand ; with Spurn high lighthouse, its breadth open to the southward of the low lighthouse, S.E.  $\frac{2}{3}$  E. ; and Grimsby church, open to the westward of a factory chimney at Grimsby, W. by S. ; Burcom, No. 4 buoy, W.  $\frac{1}{2}$  S.,  $1\frac{1}{2}$  mile ; and Sunk buoy, N.W.  $\frac{1}{2}$  W.,  $4\frac{1}{10}$  miles.

**Lower Middle, No. 2,** a *black and white horizontally striped spherical* buoy with *staff and diamond*, lies in 5 fathoms, on the south-east edge of the sand ; with Spurn high lighthouse, open to the southward of the low lighthouse, bearing S.E. by E. ; Humberston church, S.W. by W.  $\frac{1}{4}$  W. westerly,  $4\frac{3}{4}$  miles.

**BURCOM**, a considerable portion of which dries at low-water, is a narrow sand composed of firm material, which does not shift, skirting the outer edge of the broad muddy flat in front of Grimsby. Its outer end commences abreast the upper part of the Middle, and it extends to one mile from Stallingborough ferry-house, a distance of over 3 miles. Its outer edge is marked by three *can* buoys, and its south-east point by a *black spar* buoy to facilitate the passage into Grimsby docks.

**Buoys.—No. 4, or Lower Burcom,** a *can* buoy, *striped vertically black and white*, lies in 24 feet between Burcom and Clee-ness sands ; with Grimsby church, just open to the southward of a factory chimney at Grimsby, bearing W. by S.  $\frac{1}{2}$  S. ; and Humberston church, over the end of Cleethorpe pier, S. by W.  $\frac{3}{4}$  W. ; No. 5 Burcom buoy, N.W.  $\frac{1}{2}$  W.,  $2\frac{1}{4}$  miles.

**No. 5, or Middle Burcom,** a *can* buoy *striped vertically black and white*, lies in 21 feet abreast the dry portion of the Burcom ; with Cleethorpe inner mill No. 2, open of the piers of Grimsby dock, bearing S. by E. ; and Killingholme high lighthouse, open to the westward of the south-east low lighthouse, N.W. ; No. 4 Burcom buoy, S.E.  $\frac{1}{2}$  E.,  $2\frac{1}{4}$  miles ; No. 6 Burcom buoy, N.W.  $\frac{1}{2}$  N.,  $1\frac{3}{4}$  miles.

**No. 6, or Upper Burcom.**—A *can* buoy, *striped vertically black and white*, lies outside and above the upper part of the Burcom, in 15 feet, with Immingham church, open to the southward of Stallingborough ferry-house, bearing W. by N.  $\frac{1}{2}$  N.; Killingholme high lighthouse, open to the westward of the south-east low lighthouse, N.W.; No. 5 Burcom buoy, S.E.  $\frac{1}{2}$  S.,  $1\frac{3}{4}$  miles; and No. 8 Holme Ridge *black* conical buoy, N.W.  $\frac{3}{4}$  N., 2 miles.

**SUNK SPIT** is a projection from the south-west part of Sunk island; its extremity is not marked, but a *black conical* buoy, No. 6, lies in 18 feet,  $1\frac{1}{4}$  mile above it; with Patrington spire, in line with the north end of Sunk trees, bearing N.E. by  $\frac{1}{2}$  E.; Paull church, open of the jetty at Stone creek, N.N.W.; Holme buoy No. 7, N.W. by W., distant 2 miles; and Holme buoy No. 8, N.W. by W.,  $2\frac{3}{4}$  miles.

**STALLINGBOROUGH LIGHT.**—A *fixed white* light is shown from one of the windows of Stallingborough ferry-house to indicate the anchorage for large vessels below No. 7 Holme buoy. Running up, with Killingholme lights in line, it appears when abreast Burcom sand, is brightest on a W.S.W. bearing, and becomes fainter and finally disappears when abreast the Holme buoy No. 8.

**Measured Mile.**—Two pairs of spar beacons, painted red, have been placed on the right bank of the Humber, at Stallingborough, to mark a geographical mile on the line of Killingholme high lighthouse and south-east low lighthouse, for the use of steam-vessels testing their speed.

The northern beacons, which are distinguished by open square heads, are fixed at Stallingborough haven; the southern pair, which are surmounted by globes, are near Clump farm to the S.S.E. of Stallingborough ferry-house.

A vessel while being tested is required to carry two *black* balls at the fore, and ships in the vicinity should be careful to keep clear of her, and to avoid breaking her direct course.

**NEWSHAM BOOTH LIGHTS.**—Two lighthouses stand at Newsham Booth on the Lincolnshire shore about  $1\frac{1}{2}$  mile below Killingholme lighthouses; they show *fixed white* lights, the high light at an elevation of 41 feet, and the low light at  $31\frac{1}{2}$  feet above high-water. The higher tower is painted dark red, the lower tower is white, and is 90 yards northward of the former. In navigating the Humber between South Killingholme haven and Paull, the lights at

Newsham Booth serve as leading lights to the northward until the lights at Thorngumbald clough appear in line ; and to the southward until the high and lower Killingholme lights are in line. A *red* light is also exhibited from the high lighthouse at Newsham Booth to indicate the position of Holme buoy, No. 8, black ; the light is only visible when abreast that buoy.

**HOLME RIDGE**, upon which there are from 7 to 14 feet at low-water, is the southern end of the extensive mass of sands which front the eastern shore of the Humber between Stone creek and the village of Paull. The general direction of the ridge is parallel to the western shore, and it joins the next sand above it, Foul Holme. Some masses of soft clay, named the Clay Huts, with 13 feet on them, project into the channel from the upper end of Holme ridge. The south-west side of the ridge is marked by two buoys.

**Holme ridge, No. 7**, is a *black conical* buoy, with *staff and globe* near its south-east extremity, in 13 feet ; with Ottringham spire a little west of the entrance to Stone Creek, bearing N.E.  $\frac{1}{2}$  E. ; and Killingholme high lighthouse, open a little to the northward of the south-east lower lighthouse, N.W.  $\frac{3}{4}$  W.

**Holme, No. 8**, is a *black conical* buoy in 18 feet, near its south-west elbow, and N.W. by W., 7 cables from the Holme ridge buoy with the Earl of Yarborough's mausoleum, open to the westward of the shepherd's house near the battery, bearing S.W. by W.  $\frac{3}{4}$  W. ; and Killingholme high lighthouse, just open to the northward of the south-east lower lighthouse, N.W.  $\frac{3}{4}$  W.

**FOUL HOLME and PAULL SANDS** are the lower and upper portions of one continuous mass ; beginning abreast Stone creek, they extend northward, and join the eastern shore of the Humber a little below Paull village. A blind channel with depths of 2 and 3 fathoms in it, separates the body of the sands from the eastern shore. These sands are marked on their outer north-western edge by three *black conical* buoys. A shoal has recently (1888) grown up about a cable's length from the position of North Holme No. 10 buoy, the depth of which is not more than 13 feet at low water.

**Fog signal**.—From the end of the War department pier at Paull a bell is rung in foggy weather.

**Holme Hook, No. 9**, is a *black conical* buoy, in 18 feet, N. by W.  $\frac{1}{2}$  W.,  $1\frac{1}{2}$  mile from Holme buoy ; with Paull former lighthouse, on with Paull cliff, bearing North ; and Killingholme church, in line



with the south end of a cluster of trees to the westward of Killingholme lighthouses, W.  $\frac{1}{3}$  S.

**North Holme, No. 10**, is a *black conical* buoy in 21 feet, N.  $\frac{3}{4}$  W.,  $1\frac{1}{4}$  miles from No. 9 buoy, with St. Stephen's church spire at Hull, just open of Skitterness, N.W. by N.  $\frac{1}{4}$  N.; and Paull village, wholly open of Paull cliff, bearing N.  $\frac{1}{2}$  E.

**Paull Sand, or No. 11**, is a *black conical* buoy, in 18 feet, with Salt End high lighthouse, open of Paull, N.  $\frac{1}{4}$  E.; Killingholme high lighthouse, S. by W.  $\frac{1}{4}$  W.; Paull church, open to the eastward of Thorngumbald clough high lighthouse, N. by E.  $\frac{1}{2}$  E.

**KILLINGHOLME LIGHTS.**—Killingholme lighthouses consist of one high and two low lighthouses, the latter termed respectively South-east and North, or lower and upper, all standing close within the embankment on the west shore abreast Foul Holme sand. The high lighthouse and the north tower are painted dark red, the south-east tower is white, and they all show *fixed white* lights. The high light is 68 feet above high-water; the south-east low light is 35 feet above high-water, and S.E.  $\frac{1}{4}$  E. 207 yards from the high light; when in line, they lead up the main channel of the Humber between the Middle, Sunk spit, and Holme ridge to the north-east, and Bull sand, Clee-ness sand, Burcom, and Stallingborough flat to the south-westward. The north low light is 37 feet above high-water, and N.  $\frac{3}{4}$  E. 264 yards from the high light; when in line they lead between Foul Holme and Paull sands to the eastward, and Skitter sand-end to the westward.

**HALTON MIDDLE**, half a mile long, and with 15 feet over it, lies in mid-channel one mile above Killingholme lighthouses; Stallingborough ferry-house in line with Grimsby church, S. by E.  $\frac{3}{4}$  E., leads very close to its steep south-western edge; it will be avoided on the Foul Holme side by keeping the two lighthouses at Newsham Booth in line. The tides when strong ripple on this shoal.

**SKITTER SAND**, forming a turning point in the navigation, begins at Killingholme haven, and continuing round Skitter Ness confines the channel in this part of the Humber to the Yorkshire side. This sand, the most dangerous obstruction in the Humber, has a tail projecting towards the Clough lighthouses, leaving a channel but 3 cables wide past the village of Paull. A considerable part of Skitter sand dries 2 to 4 feet at low-water. This sand has recently (1888) extended to the north-eastward.

**Buoys.**—The Skitter is marked by the three following *can* buoys near its outer edge :—

**Skitter Sand End, or No. 7,** is a *can* buoy *striped vertically black and white*, with *staff and cage*, in 18 feet, N. by W.  $\frac{1}{4}$  W.  $1\frac{1}{2}$  miles from No. 11 black buoy, and below the lowest dry point of the Skitter; from it Hedon church tower is a little open to the northward of Paull former lighthouse, bearing N.E. by E.  $\frac{1}{2}$  E.; and Killingholme high lighthouse, just open to the west of the north low lighthouse, S.  $\frac{1}{2}$  W.

**Elbow, or No. 8,** is a *can* buoy, *striped vertically black and white*, moored close to the north-eastward of the dry part of the Skitter sand; from it Thorngumbald Clough high lighthouse bears S.S.E.  $\frac{1}{2}$  E., distant  $1\frac{1}{2}$  miles, and Hedon church is in line with Salt End low lighthouse E.  $\frac{5}{8}$  N.

**Anson, or No. 9,** is a *can* buoy, *striped vertically black and white*, in 15 feet, N.W.  $\frac{1}{2}$  N. 7 cables from No. 8 buoy; from it St. James church tower at Hull is on with the south pier of Albert dock, bearing N.W. by W  $\frac{1}{2}$  W.; and Sutton church is open to the eastward of the easternmost windmill on Holderness road, N.  $\frac{1}{4}$  E.

**HEBBLES.**—Foul ground, in places half a mile from the shore, extends all the way from Paull cliff to near the river Hull, confining the navigable channel round the edges of the Skitter and Hull Middle to less than a quarter of a mile in width. Preston Cranch and several other patches are upon this shelf; but the Hebbles, the principal obstruction,  $1\frac{1}{4}$  mile below the river Hull, is a collection of loose stones showing at low-water springs, with 6 fathoms close to it. Its outer edge is marked by three *black conical* buoys.

**Buoys.**—**Lower Hebbles, or No. 12,** is a *black conical* buoy, in 18 feet, with Paull church and former lighthouse in line, bearing S.E. by S.; and Marfleet church, in line with Trinity house farm, N.E., northerly.

**Middle Hebbles, or No. 13,** is a *black conical* buoy, in 18 feet, with the dome of the gaol N.  $\frac{3}{4}$  W.; Holy Trinity church tower, N.W. by W.  $\frac{1}{2}$  W.; Salt End high lighthouse, open north-east of the low lighthouse, S.E.  $\frac{3}{4}$  E.

**Upper Hebbles, or No. 14,** is a *black conical* buoy, in 12 feet, three-quarters of a mile above No. 13 buoy, with Trinity church tower, over the east end of the west pier of the Victoria dock, N.W. by W.  $\frac{1}{2}$  W.; dome of the gaol, N.E.  $\frac{1}{2}$  E.

**THORNGUMBALD CLOUGH and SALT END LIGHTS.**

—Two lighthouses stand at Thorngumbald clough, about half a mile to the southward of Paull former lighthouse; they bear from each other S.S.E.  $\frac{1}{4}$  E. and N.N.W.  $\frac{1}{4}$  W., and show *fixed white* lights, at 50 and 30 feet above high-water. The other two lighthouses are at Salt End, near Hedon haven; they bear S.E. by E.  $\frac{1}{4}$  E. and N.W. by W.  $\frac{1}{4}$  W. from each other, and also exhibit *fixed white* lights, at 50 and 30 feet above high-water. The high lighthouse at each place, supported on iron pillars, is painted red; the low lighthouses are circular towers, painted yellow, and can be moved to suit the changes in the channel. These lights are to assist in the navigation round the Skitter, and up to Hull road, from the point at which Newsham Booth, or Killingholme lights are no longer available. The high white light at Salt End becomes visible to a vessel ascending the river when about half a mile above No. 8 (black) buoy, near Holme ridge.

**HULL MIDDLE** forms the southern boundary of Hull road, and is the last of the dangers in the lower portion of the Humber needing description. Being composed of light moveable sand, the shape and height of this shoal is subject to constant change; in 1877 it dried at low-water springs to the extent of  $1\frac{1}{2}$  mile in an east and west direction. Since then (September 1879 and August 1881) the sand has been found to have grown up and extended to the northward and eastward, and in the vicinity of buoy No. 10, *black and white vertical stripes*, there is now only 4 feet at low-water. The navigable channel at this part of the river is at all times narrow; and in consequence of this extension more than usual care is requisite.

**Buoys.**—Hull Middle is marked on its north side by two *can* buoys:

**No. 10, or Hook**, a *can* buoy *striped vertically black and white* in 4 feet, N.W.  $\frac{1}{2}$  W., three-quarters of a mile from No. 9 Skitter sand; with the spire of St. Stephen's church, open to the northward of the tower of Holy Trinity church, bearing N.W.  $\frac{3}{4}$  W.; and the tower of the waterworks at Stone ferry, in line with the sailless mill on Holderness road, N. by W., westerly; Hull Middle, or No. 11 buoy, W.N.W., 6 cables.

**No. 11, or Lower West Middle**, a *can* buoy *striped vertically black and white*, lies in 15 feet, with Drypool church, on with the dock-master's office at the Humber entrance of Victoria dock, bearing N.N.W.  $\frac{1}{2}$  W.; and the low light at Salt End, open to the northward of the high light, S.E. by E.  $\frac{1}{4}$  E.

**ANCHORAGES in the HUMBER.**—The range of the tide at springs in the Humber being from 18 to 20 feet, it is always necessary to be particularly careful, when taking up an anchorage, to remember the state of the tide.

**Hawk Road**, 2 miles long and half a mile wide, between the Middle, Trinity sand, and Spurn point, affords shelter from winds between North and S.E.; it is frequented by loaded vessels with southerly winds, and by light colliers in northerly winds, but should only be used as a temporary roadstead, for the set of the tidal-stream is strong and uncertain, so that it is difficult to keep a clear anchor; in fact, a vessel has been known to snap her chain in a calm; it has also the additional disadvantage that it cannot be quitted by a sailing vessel with a south-west wind and flood tide. The bottom consists of sand and shingle with some patches of clay. In the lower part the anchorage mark is Spurn lighthouses in line, bearing S.E.; and in the upper part, the high lighthouse open a little to the northward of the low lighthouse, in a depth of 7 to 12 fathoms.

**Grimsby Road** has good anchorage under ordinary circumstances of wind and weather. Large ships generally anchor in the stream of No. 4 Burcom buoy, in from 4 to 7 fathoms, so as to avoid the strength of the tide. Small vessels anchor in the inner road in from 7 to 10 feet. The bottom is clay coated with mud.

**Caution.**—The seaman is cautioned not to anchor with Killingholme lights in line, as accidents have resulted from vessels obstructing the main navigable track.

During the prevalence of strong easterly winds as many as from seven hundred to eight hundred sail have been anchored in the roadsteads at the lower part of the Humber.

**Sunk Road**, between the upper part of the Middle and Sunk spit, has good anchorage in all weather, especially in northerly and easterly gales. There is plenty of room for a large fleet in depths of 6 to 9 fathoms, mud and clay. The tidal stream sets fairly through it; a good berth is with Patrington spire, in line with the old south-east embankment of Sunk island, bearing N.E. by N.; and Killingholme high lighthouse, open a little to the northward of the south-east lower lighthouse, N.W.  $\frac{3}{4}$  W.

**Whitebooth Road**, between Halton Middle and the Lincolnshire shore, is used by vessels which are unable to reach Hull with the

last of the flood. The proper anchorage is in 6 or 7 fathoms, with Patrington spire, in line with Salthaugh trees, bearing E. by S. ; and Grimsby church, just open to the southward of Stallingborough ferry-house, S. by E.  $\frac{3}{4}$  E.

**Paull Road** is a little below Paull cliff, and abreast Paull sluice. As the ground is hard, and the tidal stream rapid, this anchorage should be avoided, except on an emergency. A vessel driven out of it by the flood was wrecked upon Skitter sand.

**Hull Road** is to the northward of Hull Middle. In using it the only precaution necessary is not to anchor too near to the Hebbles, though the closer in the easier the tide. The bottom is mud and sand, and the depth 5 to 7 fathoms. The upper part of the roadstead is too shallow for large vessels. An armour-plated vessel belonging to the First Reserve is stationed off Hull, as also a drill ship. When the Reserve ship is absent on a cruise, her mooring buoy is marked by a *white light*, 5 feet above the buoy.

**Rules and Regulations** to be observed by vessels navigating the Humber :—

1. All vessels with two or more masts shall, when at anchor, exhibit, in addition to the ordinary anchor lights prescribed by the Board of Trade, another white light at the main or mizen peak, double the height of the bow light.
2. Canal boats, barges and other vessels, without masts, are to show a white opal frosted light at the bow, 5 feet above the deck or cargo if at anchor, or 3 feet if being towed.
3. When several craft are being towed, the sternmost craft shall, in addition to other lights, show a white light at the stern.
4. When vessels unavoidably anchor in the fairway of the river, they are to remove as soon as possible to a roadstead or proceed to their destination.
5. All vessels anchoring are to have their anchors buoyed.

**Pilots.**—There are seven pilot vessels belonging to Hull, worked by seventy-seven pilots and twenty-one apprentices and boys ; the vessels are numbered from 1 to 7 ; one of the vessels cruises from Spurn light-vessel northward to Dimlington ; another from Spurn light-vessel southward to Donna Nook ; a third in the lower part of the Humber ; and a fourth is stationed in Grimsby dock ; the remaining vessels are at Hull. They carry the usual pilot flag by day, and a *white light* at the mast-head by night.

**Steam Tugs.**—About twenty steam tugs ply on the Humber for the purpose of towing vessels in the river, and into and out of the docks and harbour.

**SOUNDINGS APPROACHING THE HUMBER.**—The depths outside the entrance to the Humber are of such a nature that they much facilitate making this important river in thick weather, which is by no means uncommon in the vicinity. The great feature is a narrow, deep ditch, which, commencing two miles south of Spurn point, runs in an easterly direction South of the Chequer shoal towards the Spurn light-vessel, and then in a general E.N.E. direction for 6 miles, when it opens out into an irregular basin-like depression of from 10 to 12 fathoms, 6 miles in length E.S.E. and W.N.W. by  $1\frac{1}{2}$  miles in breadth.

This ditch is known to the Humber fishermen as the New Sand hole ; it is very narrow, nowhere exceeding half a mile in width, and the depths in it, which commence at from 10 to 12 fathoms at its western end, increase to 25 fathoms at its eastern extreme, where it joins the before-mentioned basin. On each side of the ditch, in its immediate vicinity, the depths are from 6 to 8 fathoms.

With the exception of the New Sand hole the depths off the Humber south of Dimlington, though somewhat irregular, nowhere exceed 11 fathoms, the bottom consisting of sand and stones over an indurated brown clay. In the New Sand hole the bottom consists of sand. To the southward of the New Sand hole the ground shelves very gradually to the north-eastward from Donna Nook the five fathoms contour lines being 5 miles or upwards from the shore.

**DIRECTIONS.**—On ordinary occasions, vessels from the northward bound to the Humber should endeavour to close the land abreast Dimlington height, or Kilnsea, for both are well-marked portions of coast, and with shores free from danger. Having sighted them, and shaped a course for the entrance, keep Dimlington height to the westward of N.N.W.  $\frac{1}{2}$  W., or Kilnsea beacon to the westward of N.W.  $\frac{1}{2}$  N., so as to avoid the Outer Banks, and approach Spurn light-vessel on a S.W. bearing, passing on either side of her as convenient. From her, Bull sand light-vessel bears W. by N.  $\frac{1}{2}$  N., distant  $4\frac{3}{4}$  miles, and in this track the black conical buoys on Stone Banks must be left on the starboard hand, and Chequer shoal spherical buoy on the port hand.

In working, stand towards Stone Banks until Grimsby church

appears in line with Bull light-vessel, bearing W. by N.  $\frac{3}{4}$  N. ; Spurn low light obscured by the high light, N.W., leads well to the eastward of the Sandhaile ; and Grimsby church, kept in line with the westernmost windmill at Cleethorpe, N.W. by W., will lead over the north-east part of the flat in 12 feet.

In misty weather, steer in boldly for the land about Dimlington, keeping the lead going. When the height has been sighted, continue along the land to the southward until Kilnsea beacon is seen. Then haul out to the south-eastward and keep the lead going quickly until soundings are struck in the New Sand hole (the ditch previously described), then by keeping a West to W.S.W. course, and maintaining a depth of over 12 fathoms, a vessel will be led up to the Spurn light vessel.

In coming from the southward, after passing the Protector shoal, by keeping in a depth of from 5 to 6 fathoms at low water, a vessel will be led up to the Spurn light vessel, outside the Rosse sand and Sandhaile. The shore to the south of the Humber is very low, and few objects are to be seen even in clear weather. The beacon on Donna Nook, a six armed windmill  $1\frac{1}{2}$  miles S.W. by S. from it, and Saltfleet mill, are the most conspicuous objects.

**By Night.**—While closing from the northward or eastward, keep Spurn floating light bearing to the westward of S.W. and between that and West ; pass close to the southward of it, and then steer W.S.W., taking care not to bring Spurn light-vessel more easterly than E. by N., to avoid Chequer shoal ; when Spurn low light is well open south of the high light, N.W. by N., the Chequer shoal will be on the beam and the Bull light-vessel will bear N.W. by W.  $3\frac{1}{4}$  miles, keep her on that bearing and pass to the northward of her. In working, keep Bull light to the northward of W.N.W., in order to avoid the Stone Banks. If approaching the Humber from the south-eastward, keep Spurn low light obscured by the high lighthouse, bearing N.W., until Spurn floating light bears N. by E. ; then make a W. by N.  $\frac{1}{2}$  N. course for  $2\frac{1}{4}$  miles until the floating light bears E.  $\frac{3}{4}$  N., when a N.W.  $\frac{1}{2}$  W. course for 3 miles will lead up to Bull light-vessel as before. On no account decrease the depth to less than  $5\frac{1}{2}$  fathoms until the marks or lights are distinguished.

In vessels of heavy draught attention must be paid to the Caution on p. 139 as to avoiding the Chequer shoal. In misty weather large vessels are recommended to wait for half flood before entering, or

leaving, that is, of course, when the clearing marks are not to be distinguished.

**TIDAL INFORMATION.**—In making the Humber by the lead it is necessary to bear in mind the fact that the rise and fall outside the entrance to this river amounts at springs to 18 feet, and that consequently due allowance must be made for the state of the tide when comparing the depths obtained with those given on the chart. In order to aid the seaman in this operation the following table has been constructed, which shows the amount to be subtracted from the depths obtained, depending on the time and height of the tide at Hull, which is given daily in the Admiralty tide tables.

TABLE SHOWING THE AMOUNT TO BE SUBTRACTED FROM THE DEPTHS OBTAINED OUTSIDE THE RIVER HUMBER TO ASCERTAIN THE DEPTH AT LOW WATER.

State of the Tide at Hull.	Rise at Hull.							
	15 ft.	16 ft.	17 ft.	18 ft.	19 ft.	20 ft.	21 ft.	22 ft.
High water - - - subtract	12 ft.	13 ft.	13 ft.	14 ft.	15 ft.	16 ft.	17 ft.	17½ ft.
At 1 hour after high water "	11 "	11 "	11½ "	12 "	12½ "	13 "	13½ "	14 "
At 2 " " "	9 "	9 "	9 "	9 "	9 "	9 "	9 "	9 "
At 3 " " "	7 "	7 "	6½ "	6 "	5½ "	5 "	4½ "	4 "
At 4 " " "	6 "	5 "	5 "	4 "	3 "	2 "	1 "	½ "
At 5 " " "	5 "	4 "	4 "	3 "	2 "	1 "	0 "	0 "
Low water - - - "	6 "	5 "	5 "	4 "	3 "	2 "	1 "	½ "
At 1 hour after low water "	7 "	7 "	6½ "	6 "	5½ "	5 "	4½ "	4 "
At 2 " " "	9 "	9 "	9 "	9 "	9 "	9 "	9 "	9 "
At 3 " " "	11 "	11 "	11½ "	12 "	12½ "	13 "	13½ "	14 "
At 4 " " "	12 "	13 "	13 "	14 "	15 "	16 "	17 "	17½ "
At 5 " " "	13 "	13½ "	14 "	15 "	16 "	17 "	18 "	19 "

**Tidal streams.**—The flood stream coming from the northward is diverted into the Humber and a slackening is caused in the vicinity of Donna Nook ; the ebb stream setting to the northward being met by the ebb stream from the Humber, is pushed away from the coast, and the tide off Donna Nook is again slackened, which no doubt causes the shoal water which shelves from that point. The general direction



of the flood and ebb streams, well outside the Spurn light-vessel, is N.N.E. and S.S.W., the rate at springs being quite 3 knots per hour. The change of stream takes place at or near the time of high water at Hull, although the actual time of high water outside the Humber is at least an hour before the time of high water at Hull. Inside the Spurn light-vessel the stream is affected by the indraught into the Humber, but the flood sets down upon the Sandhaile spit and the ebb over the Stone banks.

**Caution.**—As a general rule, a stranger should not enter the Humber without the assistance of a pilot when one can be obtained, for the land on either side is so low that few sailing or clearing marks can be given, and everything depends upon the correct courses and distances being made, to insure which an intimate acquaintance with the set of the tidal stream is necessary.

In entering the Humber, either running or working, due allowance must be made for the ebb stream, which as before remarked sets strongly across the Stone Banks, and also for the flood stream, which sets down upon the Sandhaile in a like degree. Their common rate during springs is about 4 knots; the ebb, however, runs more rapidly during freshes. North-west gales and a flood tide cause the highest sea at the mouth of the Humber.

Having the option, it is better to wait for daylight than to work by night. During heavy on-shore gales, the proper night track is to the southward of Spurn light-vessel.

In strong northerly gales and flood tide, many accidents have happened from vessels not keeping close enough to the Stone Banks, for having both tide and wind on their beam, they fail to fetch into the mouth of the Humber, are thrown to leeward upon Sandhaile flat, let go their anchors in broken water, and are lost.

Again, with southerly winds and ebb tide, vessels as often get upon the Stone Banks from not paying attention to the bearings of the Spurn and Bull sand light-vessels. The same accident also occurs to vessels from the southward with south-westerly winds running too far to leeward before hauling up, whereas, by keeping in a depth of 5 or 6 fathoms round the Sandhaile, they would have been led up to Bull sand light-vessel.

**From Spurn Point to the Burcom.**—If proceeding to Hawk road for shelter in easterly or north-easterly gales, give Spurn point a berth of half a mile, as it is too steep to be rounded by the lead;

having passed the point, steer in to the northward, and cross the line of the lighthouses. In entering by night, keep well over towards Bull light-vessel, until Spurn lights have been brought to the eastward of N.E. Spurn point will then have been passed, and Hawk road may be entered. For a description of this anchorage, see page 149.

In proceeding up the Humber, a N.W.  $\frac{3}{4}$  N. course for  $2\frac{1}{2}$  miles from Bull light-vessel will lead to a fair berth abreast Clec-ness buoy ; and N.W. by W.  $\frac{1}{2}$  W. for about 2 miles further to abreast Grimsby road and the lower end of the Burcom. When working in the same district, the *black conical* buoys to the north-eastward, and the Bull, Clec-ness, and Burcom *can* buoys to the south-westward, sufficiently point out the channel.

**By Night**, from near Bull sand light, steer N.N.W. for one mile, and bring Killingholme lights in line bearing N.W.  $\frac{1}{4}$  W., which is the leading mark through the channel nearly up to the lights.

**Caution** is necessary in approaching Middle sand, as it is liable to change.

Grimsby and Sunk roads have been described on page 149.

**From the Burcom to Skitter Sand.**—Killingholme lighthouses in line, N.W.  $\frac{1}{4}$  W., is the mid-channel mark from the Burcom to about half a mile above No. 8 *black conical* buoy. In working, and being above the Middle light-vessel, open them a little either way, and be careful of the Burcom, Sunk spit, and Stallingborough flat, as they are steep-to. The Sunk spit, Holme ridge, and Holme *black conical* buoys mark the north-eastern boundary of the channel.

From half a mile above No. 8 *black conical* buoy, Grimsby church, in line with Stallingborough ferry-house, bearing S. by E.  $\frac{3}{4}$  E., leads westward of Halton Middle, and to abreast Killingholme haven. In working, open the church a little either way ; this will also clear the Clay Huts near the north-west part of the Holme ridge. Their position is generally marked by the tide ripple. As, however, the above objects are low and distant, care must be taken not to stand too close to the banks which are steep-to.

From abreast Killingholme haven, Killingholme high lighthouse and north low lighthouse in line, bearing S.  $\frac{3}{4}$  W., leads up to the first Skitter buoy, No. 7, *black and white vertical stripes* ; but the more direct course is from about three-quarters of a mile above No. 8 *black* buoy, to proceed with Newsham Booth lighthouses in line, bearing

south, which will lead westward of the Clay Huts, and eastward of Halton Middle. In standing eastward keep Paull village in sight outside Paull cliffs, and do not shoal less than 4 fathoms, and towards the flat of the Skitter to the same depth. It may here be observed that unless the lead is carefully and quickly attended to, it is little use in standing toward such dangerous sands as those of the Humber.

**By Night,** keep Killingholme high light and south-east low light in line, bearing N.W.  $\frac{1}{4}$  W., until the leading lights at Newsham Booth appear in line, bearing South, when the high *white* light at Salt End will become visible; then steer North, keeping Newsham Booth lights in line, and the high light at Salt End a little on the Starboard bow, until Killingholme high light and north low light are in line, bearing S.  $\frac{3}{4}$  W., and the lights at Thorngumbald clough are also in line, S.S.E.  $\frac{1}{4}$  E., which course will lead clear of the Clay Huts, Halton Middle, and Skitter sand end.

**Caution.**—The flood stream splits abreast Sunk spit, or No. 6, *black conical* buoy, one portion setting strongly over Holme ridge and through the main navigation, the other into the blind channel between Foul Holme sand and the north shore. Should a vessel in light winds be drawn into the latter set, an anchor must be promptly let go.

Whitebooth and Paull roads are described on pages 149, 150.

**From Skitter Sand End to Hull.**—The remainder of the channel up to Hull is curved and narrow, with rapid tidal streams setting through it. Newsham Booth lighthouses in line, bearing South, or Killingholme high lighthouse and north low lighthouse in line, bearing S.  $\frac{3}{4}$  W., will lead clear of Skitter sand end, and lead to the eastward of the *black* and *white vertically striped* buoy, No. 7; half a mile above which the lighthouses at Thorngumbald clough, to the southward of Paull, appear in line, S.S.E.  $\frac{1}{4}$  E.; then, the low lighthouse kept a little open westward of the high lighthouse will lead in mid-channel, until the lighthouses at Salt End show in line, S.E. by E.  $\frac{1}{4}$  E., which latter mark will guide a vessel up to the lower part of Hull road. Throughout this portion of the channel the *black* and *white vertically striped* can buoys of the Skitter will be on the port hand, and the Hebbles *conical black* buoys on the starboard hand.

**At Night,** Newsham Booth lights in line, bearing South, or Killingholme high light and north low light in line, bearing S.  $\frac{3}{4}$  W., serve as leading lights until abreast Paull village; when the low light

at Thorngumbald Clough will appear a little open westward of the high light, to lead up to the second turn in the channel ; where the lights at Salt End showing in line, S.E. by E.  $\frac{1}{4}$  E., will then guide up to the lower part of Hull road.

**Caution.**—It must be remembered that through the shifting nature of Skitter and Hull Middle sands, this is the most critical portion of the navigation of the Humber, and as a mistake would be attended by the most serious consequences, great care should be observed in carefully following the above directions. Hull Middle sand has lately been found to have grown up and extended to the northward and eastward ; vessels drawing 15 feet and upwards, when rounding its northern end, should not bring the high light at Salt End open southward of the low light, and must give buoy, No. 10, a good berth. *See page 148.*

Great caution is necessary while in the vicinity of the Hebbles, for the flood stream sets obliquely upon the shoal.

**TIDES.**—It is high water, full and change, at Spurn point at 5h. 26m. ; springs rise  $18\frac{3}{4}$  feet, neaps 15 feet, and neaps range  $11\frac{1}{4}$  feet. At Grimsby, at 5h. 36m. ; springs rise  $19\frac{1}{4}$  feet, neaps  $15\frac{1}{4}$  feet, and neaps range  $11\frac{1}{4}$  feet. At Killingholme, at 6h. 2m. ; springs rise  $19\frac{3}{4}$  feet, neaps  $15\frac{3}{4}$  feet, and neaps range  $11\frac{3}{4}$  feet. At Hull, at 6h. 29m. ; springs rise  $20\frac{3}{4}$  feet, neaps  $16\frac{1}{4}$  feet, and the range of neaps is  $11\frac{3}{4}$  feet. At Goole, at 7h. 26m., or 57m. after high-water at Hull ; springs rise  $13\frac{1}{2}$  feet, and neaps range 9 feet. During freshes the tidal stream is said to run 5 or 6 knots per hour through Blacktoft road, and 3 to 4 knots over the river generally.

**The Humber above Hull.**—No directions can be given for the Humber above Hull owing to the constant changes in progress ; but the Corporation of the Trinity House at Hull have erected several high and low beacon lights on either shore of the upper Humber fitted on tramways, which are moved as requisite to mark the channels. A light-vessel is anchored off the pitch of Whitton ness ; she is also moved as the channel alters. Local knowledge of these changes is therefore absolutely requisite, and vessels proceeding to points on the Humber above Hull should have qualified pilots on board.

## CHAPTER V.

## HUMBER TO CROMER, WITH BOSTON AND LYNN DEEPS.

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Variation,  $17^{\circ} 20'$  to  $16^{\circ} 40'$  West in 1889.

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THE deep bight between the Humber and Cromer, the upper part of which is indifferently termed Lynn Deep and the Wash, is for the most part occupied by numerous and dangerous sands, some skirting the main, whilst others lie out a considerable distance in the offing ; through these sands the several rivers which have their outlets in the Wash find their way at low-water. The rapidity of the tides in this deep bight, the low character of its shores, and the mist which almost constantly prevails, render this the most difficult portion of the navigation on the eastern coast, and consequently a more than common degree of vigilance is necessary when navigating in this locality. The coast, and dangers adjacent to it, will be first described, and then the off-lying sands.

**THE COAST.\***—The western boundary of the Wash consists of extensive marsh lands, the northern portion of which is bounded by sand-hills, but the southern part is so low as to require embankments for its protection. From Donna Nook, at the entrance of the Humber (page 140), the coast is fronted by sand-hills to Gibraltar point 25 miles to the southward. The most conspicuous objects to be seen are a six armed mill, inside Donna Nook, South Summercoates church spire, Theddlethorpe church towers, Trusthorpe windmill, Addlethorpe and Ingoldmells church towers, Ingoldmells windmill and the new watering place Skegness. In very clear weather the tall spire of Louth church as well as the Lincolnshire downs may be seen in the background.

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\* See Admiralty chart of the east coast of England, sheet IV., Cromer to Trusthorpe, with views, No. 1,455 ; scale, mile = 0·5 inch ; will be superseded shortly by new chart, Blakeney to Flamborough head, scale = 0·5 inch to the mile.

**SALTFLEET**, the first village on the coast south of Donna Nook was formerly a considerable market town, but the greater part of it was destroyed by an inundation of the sea. Here is a conspicuous windmill and much wood, and abreast are some noted oyster grounds. A rocket apparatus is kept at Saltfleet in case of wreck.

**THEDDLETHORPE**, next south of Saltfleet, has two conspicuous churches ; those of East and West Theddlethorpe which stands prominently

forward, near  
the coast-line ;  
a clump of



East and West Theddlethorpe churches, S.W. by W.  $\frac{1}{4}$  W.

trees is seen between them when East Theddlethorpe church is on a S.W. by W.  $\frac{3}{4}$  W. bearing. Both churches have towers, West Theddlethorpe is surmounted by a Flagstaff and weather cock. East Theddlethorpe has a little pinnacle at each corner of the tower.

**TRUSTHORPE or MABLETHORPE**, the next village to the southward has become a small watering place, connected to Louth by a railway. Trusthorpe windmill is very conspicuous and may be seen 10 miles in clear weather, the church is close behind the sand-hills, it has a low tower with a pinnacle at each corner ; there is a long high sand-hill a little to the northward, and a coastguard station one mile to the southward of it. Beyond Trusthorpe, the sand-hills are of moderate height for a mile or two, with a few houses showing here and there between and upon them ; they then decline, being in some places not more than 15 to 20 feet in height, and the shore is defended by extensive groynes.

**SUTTON-ON-SEA**.—About one mile south of Trusthorpe mill is the small village of Sutton-on-Sea, very little of which can be seen owing to the sand hills in front hiding it.

**INGOLDMELLS POINT**.—A large white house with red tiles and three stacks of chimneys, stands on the sand-hills one mile to the northward of Ingoldmells point ; and another house blue slated and white-washed, is a mile to the southward of the point, which may readily be known by these objects. Within the point, Addlethorpe and Ingoldmells churches, used as marks for the swatchway between Docking shoal and Burnham flats are very plain objects, as is also Ingoldmells windmill.



Addlethorpe church  
W.  $\frac{1}{4}$  N.



Ingoldmells church,  
W.  $\frac{1}{4}$  S.

The remainder of the coast to Gibraltar point is low, few of the sand-hills being 20 feet high, and several windmills are seen a little distance behind them. Winthorpe church is a bold object, but the stunted square tower of Skegness church will scarcely be seen above the sand-hills from any direction.



Winthorpe church,  
W. by N.  $\frac{1}{4}$  N.

**Skegness.—Pier and Lights.**—A promenade and landing pier, 1820 yards in length and formed on iron piles, extends in an east direction from Skegness. There is a depth of 23 feet at the outer end of the pier at high-water of ordinary springs, but it is dry at low-water.

At night two *fixed white* lights, placed vertically, are shown from a staff at the pier-head.

**COAST.**—From Gibraltar point to the head of the Wash, the shore is low and embanked.

**Life-Boats**, rockets, &c., are stationed at Mablethorpe, Sutton, Chapel, and Skegness.

**DANGERS off the COAST.**—All the coast above described is fronted by a shoal-water flat of varying breadth, upon which are the shoals named Rosse sand, Theddlethorpe Middle, and Clay Huts; Saltfleet, Theddlethorpe and Trusthorpe overfalls, and the Protector overfalls.

**ROSSE SAND.**—Near Donna Nook has one to six feet over it and extends as a 2 fathoms spit three miles and as a 3 fathoms spit  $4\frac{1}{2}$  miles off Donna Nook.

**Buoy.**—A can buoy, *striped vertically black and white*, and marked Rosse spit, lies in  $4\frac{1}{4}$  fathoms; with Donna Nook beacon W.  $\frac{1}{2}$  S.,  $4\frac{2}{10}$  miles; Saltfleet mill, S.W.  $\frac{1}{2}$  W., distant 6 miles. There is a patch of 17 feet 2 cables inside this buoy.

**Theddlethorpe Middle, and the Clay Huts**, uneven patches of ground near Theddlethorpe and Trusthorpe, are too close to need special description.

**Saltfleet, Theddlethorpe, and Trusthorpe Overfalls** are patches with  $2\frac{1}{4}$  to 4 fathoms upon them, lying out from 2 to 5 miles from the main, abreast the respective places from which they take their names; all lie inshore of the track of large ships, and there is plenty of water over them for small vessels.

**PROTECTOR OVERFALLS**,  $2\frac{1}{2}$  miles outside of Saltfleet Overfalls, consist principally of a ridge of sand extending in a north

and south direction for 2 miles, with only 12 feet upon the shoalest part, but having 7 to 8 fathoms on their west side, and shelving gradually to the eastward; Saltfleet mill is W. by N.  $\frac{3}{4}$  N., nearly 8 miles from the middle of it. There are also detached patches of 4 and  $4\frac{1}{2}$  fathoms one mile to the southward. Lying so far off shore, these shoals are greatly in the way of vessels proceeding from the Humber to Lynn Deep.

**Buoy.**—A *black* conical buoy lies in  $4\frac{1}{2}$  fathoms 6 cables to the south-eastward of the shoalest part of the sand; from it, a grove of trees in line with West Theddlethorpe church, bears West; South Somercotes church spire is open northward of Saltfleet mill W. by N.  $\frac{3}{4}$  N.; Trusthorpe mill W.S.W.  $7\frac{1}{4}$  miles.

**INNER DOWSING** is an extensive ridge of sand  $5\frac{1}{4}$  miles long S. by W., and N. by E. and one-third of a mile broad which has for the most part a depth of only 4 to 6 feet over it at low-water. Its north end is S.S.E., 7 miles from the Protector Overfalls. Like many other sand ridges it has on its western or inner side one mile from its summit a narrow gully, with 10 to 16 fathoms running parallel with the ridge; outside the shoal, the depths are 10 or 11 fathoms over even ground. One mile to the north-westward of the north extreme of the ridge there are a cluster of 2-fathoms patches named Inner Dowsing Overfalls, and one mile to the south-eastward of its south extremity there is a detached 3-fathoms ridge. These dangers are in the fairway of vessels bound to Lynn Deep, and are marked by buoys and a light-vessel.

**INNER DOWSING LIGHT-VESSEL** lies in 10 fathoms at low-water near the north-east end of the Inner Dowsing. The light, which is 38 feet above the sea, is a *revolving green* light showing a *flash every twenty seconds*, and should be seen in clear weather at the distance of 11 miles. In order to render this vessel readily distinguishable in the day from the other light-vessels in the vicinity, two globes are borne on the mast, one above the other, the upper globe, the top of which is 70 feet from the water-line, being smaller than the lower globe.

The position of the light-vessel is latitude  $53^{\circ} 19' 20''$  N.; longitude  $0^{\circ} 34' 30''$  E. From here, Trusthorpe mill bears W. by N.  $\frac{3}{4}$  N., distant nearly 11 miles, and Ingoldmell's mill, S.W. by W.  $\frac{3}{4}$  W.,  $12\frac{1}{4}$  miles. North Inner Dowsing buoy, S.W. by W., distant  $1\frac{1}{4}$  mile; South Dowsing buoy, S. by W.  $\frac{1}{2}$  W.,  $6\frac{1}{2}$  miles; North



Race bank buoy, S.E.  $\frac{3}{4}$  S.,  $8\frac{1}{2}$  miles ; and Dudgeon light-vessel, S.E. by E.,  $14\frac{1}{2}$  miles.

**Fog Signal.**—In thick or foggy weather a gong is sounded.

**BUOYS.**—**North Inner Dowsing**, a spherical buoy, *striped horizontally black and white*, with *staff and diamond*, lies upon the north end of the Inner Dowsing ridge in 5 fathoms ; with Trusthorpe mill bearing N.W. by W.  $\frac{3}{4}$  W., distant  $10\frac{1}{2}$  miles ; and Inner Dowsing light-vessel, N.E. by E.,  $1\frac{1}{2}$  mile.

**South Inner Dowsing**, a spherical buoy, with *black and white horizontal stripes*, with *staff and inverted triangle*, lies in 6 fathoms, at the south end of the Inner Dowsing ridge ; with Ingoldmells church, W. by N., distant  $8\frac{6}{10}$  miles ; and Inner Dowsing light-vessel, N. by E.  $\frac{1}{2}$  E.,  $6\frac{1}{2}$  miles.

**Overfalls**, a can buoy, *striped vertically black and white*, and surmounted by a staff and cage, lies on the north-west side of the Inner Dowsing overfalls, in 7 fathoms ; with Trusthorpe mill, N.W. by W.  $\frac{3}{4}$  W.,  $8\frac{1}{10}$  miles ; and Inner Dowsing light-vessel, E.  $\frac{1}{4}$  S. distant  $2\frac{3}{4}$  miles.

**TIDAL STREAMS.**—From a register kept on board the Inner Dowsing light-vessel, it appears that although the stream has a rotatory motion it will be found running to the S.W. when the water is rising at Hull, and to the N.E. when the water is falling there, the following table gives the set of the stream for each hour :—

At low water at Hull, stream sets	N.W.	$\frac{1}{4}$ knot.
1 hour after low water	„ S.W.	$\frac{1}{3}$ „
2 „ „ „	S.W. by S.	$1\frac{1}{2}$ „
3 „ „ „	S.W. by S.	2 „
4 „ „ „	S.S.W.	$1\frac{1}{2}$ „
5 „ „ „	S. by E.	$\frac{1}{2}$ „
High water	„ East	$\frac{1}{2}$ „
1 hour after high water	„ N.E. by E.	1 „
2 „ „ „	N.E. by N.	$1\frac{1}{2}$ „
3 „ „ „	N.N.E.	2 „
4 „ „ „	N. by E.	$1\frac{1}{4}$ „
5 „ „ „	North	$\frac{1}{2}$ „

From the Spurn to the Inner Dowsing the general direction of the stream is S.S.W., but it follows the line of the shore when close to the coast.

**SKEGNESS MIDDLE.**—The flat which fronts the Lincolnshire coast (already alluded to) shelves gradually from the main to the 5-fathoms edge ; the breadth is 3 miles abreast Saltfleet, and 5 miles abreast Ingoldmells point ; from whence it trends south-westerly, and becomes merged in the shoals forming the bar of Boston Deep. A narrow ridge with 5 feet on it, named Skegness Middle, extends in a north-easterly direction from the shore abreast Skegness.

**Buoy.**—A *black* can buoy lies on the east side of the Skegness Middle, about the centre, 6 cables from the pier head.

**WAINFLEET ROAD**, or (as it is locally termed) “Between the Knock and the Main,” is a narrow channel formed between the shore and Boston Knock, one of the boundaries of Boston bar. Vessels of moderate draught driven out of Lynn Well by strong southerly and south-westerly winds often take shelter here and ride securely, and vessels have also been known to ride safely in it in strong north-easterly gales. The roadstead, however, is not so available when Wainfleet swatchway happens to become closed, for then it is a blind channel without a southern outlet. In entering from the northward, keep within one mile of the land, and anchor with Gibraltar house bearing from West to W.N.W., about one mile distant, in  $2\frac{1}{2}$  or 3 fathoms, mud and clay. In every part of the road the anchors hold well, and the farther up the less sea.

**CAUTION.**—The seaman must be careful, in entering Wainfleet road, not to get within Skegness Middle, a mistake often made. A depth of  $3\frac{1}{2}$  fathoms at low water will lead outside it.

**WAINFLEET HARBOUR** is formed by the outlet of the river Steeping, which passes Gibraltar point with a winding course to the south-west and south-eastward, and then discharges itself into Wainfleet road. The entrance is marked by two can buoys, *striped vertically black and white* on the port hand, and *black* on the starboard side, and the channel farther in is beacons by stakes. The bar is five feet above low water ; it has consequently 15 feet over it at high-water springs ; there is 12 feet in the channel as far as Gibraltar house, and 8 feet at the sluices  $1\frac{1}{2}$  mile above it, where the navigation ends, but owing to the small amount of backwater, the channel throughout is very narrow.

**Wainfleet**, 5 miles in-shore of Gibraltar point, is scarcely visible from the sea. Before the decay of its harbour it was a place of importance, and supplied two ships of war to the expedition against

Brittany in 1359. Now it has but a small coal trade, and employs only a few vessels. Fishermen act as pilots for the place when required. The principal difficulty in entering is occasioned by the irregular set of the flood-tide across the entrance channel.

**Wainfleet Swatchway**, a narrow passage between the Inner Knock and Wainfleet sands, thus connecting Wainfleet road with Boston Deep, had, in 1871, 7 to 13 feet at low-water springs ; it has two small buoys at its north-east entrance ; a *chequered red and white* can buoy at the south-west end of the Inner Knock, and Wainfleet *black* buoy mark its opposite end. This swatchway is, however, sometimes blocked up, as was the case in 1867, and cannot therefore be depended upon.

### BOSTON DEEP.

Boston Deep begins abreast Skegness, and terminates at Clay Hole, near the entrance of the Witham ; it is about 15 miles in length, with an average width of one mile, and is bounded by Boston Outer and Inner Knocks, Wainfleet sand, and the extensive flat skirting the main, to the north-westward, and by the Dogs Head, Long sand, and other sands, which partly dry at low-water, to the south-eastward. The general depths throughout the Deep vary between 4 and 6 fathoms.

**BOSTON BAR**, as the entrance to Boston Deep is called, is a passage one-quarter of a mile wide, between the lower portions of Boston Knock and Dogs Head sands, which lie in a direction nearly parallel to the shore ; the former sand some distance within the bar, uncovers at about two-thirds ebb, and the latter also dries at low-water ; both are subject to change. There was a depth of 10 feet upon the bar at low-water springs in 1871, which was reported to have increased to 15 feet in 1883.

**BUOYS.**—The channel across Boston bar is marked by two black buoys on the starboard hand, and by two *black and white vertically striped* can buoys on the port hand. The Outer buoy on the starboard side, which is named Outer Knock, is *conical* with staff and globe, the inner starboard hand buoy, named Inner Knock, is a *can*. The outer port hand buoy is named Outer Dogs head and the other Inner Dogs head. The position of these buoys, with reference to the shoals and the channel between them, may always be relied on, as they are shifted immediately any change occurs.

The north-western boundary of Boston Deep, within the Inner Knock bar buoy, is clearly defined by *black* can buoys, namely, four for the Outer Knock, two for the Wainfleet sand, three for Scullridge (the outer one with staff and triangle), the others being distributed along the margin of the flat; the third buoy above the Inner Scullbridge, named High Horn, has a staff and ball, and lies with Boston and Frejston churches nearly in line N.W. by W.  $\frac{3}{4}$  W. Vessels bound to Boston usually anchor abreast, or a little above this buoy.\*

The sands on the south-eastern side of the Deep are marked by eight can buoys, *striped vertically black and white*; the first being 4 cables within the Inner Dogs Head bar buoy, the next is 9 cables farther up on the Outer Dogs sand head, then one between the Outer and Inner Dogs head; another farther up off the south-west end of Inner Dogs Head sand, then three buoys mark the western half of Long sand, and the sixth buoy is at the north extreme of Bar sand.

The narrow portion of the channel upward is buoyed on either side, the same arrangement as to colours being continued, viz., *black* buoys on the starboard side in entering and *vertically striped black and white* buoys on the port side.

**Lights.**—Two leading lights, fixed *white*, have been placed on the Scalp sand to lead to the entrance of the river Witham. They bear from each other E. by N  $\frac{1}{8}$  N. and W. by S.  $\frac{1}{8}$  S.

**SCULLRIDGE**, nearly 8 miles within Boston bar, is a narrow sand having patches with 6 feet over them at low-water; it is above 2 miles in length from a depth of 3 fathoms at each end, and lies in the direction of, and midway across, the Deep.

**Buoys.**—The channel, which was formerly to the northward of this sand, having shoaled up, the buoys have been moved to mark the south side of the sand; they are now *black* buoys, and are named Outer, Middle, and Inner Scullridge; the outer buoy has a staff and triangle, the others are cans.

**DIRECTIONS.**—Boston bar bears S.W. (westerly), 12 miles from North Inner Dowsing buoy; W. by S.  $\frac{1}{4}$  S., 12 miles from the Docking buoy; W. by N.  $\frac{1}{4}$  N.,  $8\frac{1}{2}$  miles from Burnham flats buoy; and S.  $\frac{1}{2}$  E.,  $3\frac{1}{2}$  miles from Ingoldmells point.

Bound to Boston Deep from round the north end of the Docking or from the direction of the Humber, as the case may be, and being

\* See Admiralty chart of the Wash, Skegness to Blakeney, No. 108; scale, mile = 0.95 inch.

about 2 miles off shore, with Addlethorpe church open to the westward of Ingoldmells church, the buoys marking the channel across Boston bar will be seen to the south-westward. The course between them is generally S.W. by S. for about one mile, the *black* buoys being to the north-west, and the *black* and *white vertically striped* buoys to the south-east.

Boston bar may be crossed in the strongest gale from the north-east or eastward, for but few accidents have been known to happen from doing so. Vessels drawing 9 feet may pass it at any time of tide in moderate weather, and those of 14 or 15 feet at first-quarter flood. It is usual to keep on the Dogs Head side, as the bar is there narrower, and the water deeper; and should a vessel touch the ground, the flood-stream would set her from the shoal instead of upon it.

**CAUTION.**—In approaching Boston bar, it is necessary to guard against shifting ridges of sand that sometimes form a quarter of a mile to the northward of Boston Knock buoy.

As Boston bar is not lighted, no vessel should attempt to cross it at night.

Above the Dogs Head and Knock buoys, the Deep becomes wider, and the course, from the outer buoys about S.W. by S., for one mile, is then S.W.  $\frac{1}{2}$  S.,  $2\frac{1}{4}$  miles, to abreast the buoy at the south-west end of the Outer Knock, from whence a S.W.  $\frac{3}{4}$  W. course for  $4\frac{1}{4}$  miles will lead to the Outer Scullridge buoy. The channel is now to the southward of that shoal, and a W. by S. (southerly) course for  $6\frac{1}{4}$  miles will lead between the three *black* buoys marking it and the *black* and *white vertically striped* buoys on Long sand, and up to the High Horn buoy, where anchor and obtain a pilot. In working, tack on the first shoal cast, as both sides are steep.

Vessels formerly anchored in Clay Hole, on the north-west side of Herring sand, but this anchorage has silted up considerably of late years, and there is now only 6 to 10 feet depth in it at low-water. Here the Boston pilot-vessel rides. In winter nights she carries a bright light during the flood, and until half-ebb.

During north-east gales there is considerable weight of sea in the Deep from half-flood to half-ebb, but, as a general rule, it is observed that the farther up the less sea. In northerly gales, vessels ride more securely in Boston Deep than in the more exposed anchorage, Lynn road. The best position is above the Scullridge, where there is ample room, and the bottom is sand and clay; below

the Scullridge, the bottom is sand and loose stones. Boston Deep is also specially available for vessels that have lost their anchors, and are unable to reach the Humber, for they may be laid ashore upon the soft ground abreast Clay Hole without sustaining any damage.

**BOSTON** is seated on both banks of the river Witham, 5 miles above its junction with the Welland in Fosdyke Wash. This town was equal in commercial importance to the metropolis itself in the thirteenth century, but a succession of fires and inundations caused its prosperity to decline from the end of the fifteenth century, and now its trade is of minor importance.

Boston parish church, erected in 1309, is dedicated to St. Botolph; its elegant and lofty tower is a well-known object to seamen, among whom it has obtained the rather questionable appellation of "Boston stump." It is of the perpendicular style, and surmounted by an octagonal lantern, which would seem to have been designed for a beacon light; the total height from the ground is 263 feet, and it may commonly be seen in clear weather at the distance of about 25 miles.

In the middle of the eighteenth century, the river and haven had fallen into a ruinous state through neglect; in 1720, a vessel of 250 tons could get up to Boston, but thirty years later vessels of 40 and 50 tons could with difficulty reach it at the top of spring tides; this deterioration is said to have been caused by a diversion of the Fen waters from the Witham. Important improvements have, however, been carried out of late years; the watercourse has been judiciously narrowed; several awkward bends have been cut across, thereby straightening the river from Skirbeck to Hob Hole, and the sides defended by faggot work, leaving an average width of 220 feet; the channel is besides well lighted from the town to the Scalp. A wet dock of about 7 acres in extent has been constructed at the south end of the town, and was opened in 1884. It is 835 feet long by 450 feet in width, with an entrance lock 300 feet long and 50 feet wide, over the sill of which there is 25 feet at ordinary spring tides. A wooden pier extends from the lock entrance to Maud Foster sluice, which is fitted with bollards, &c., to facilitate docking or undocking vessels. 400 vessels entered the dock in 1886 of an aggregate tonnage of 45,170 tons. Before these improvements were begun, sloops drawing 6 feet could reach the town only during springs.

The river is crossed at the town by a fixed iron bridge, with an arch of 86 feet span, and a little above it by a sluice. This barrier, named

the Grand sluice, by preventing the ingress of the tidal water into the upper section of the Witham, converts the lower portion of the river into a mere inlet, in which rapid deposition of the lighter particles of sea sand, to the extent of several feet, takes place in dry seasons, to be again removed by the first long continued flood. There are two quays in addition to the dock at Boston, but vessels, if they do not go into dock, secure to stages below the town, where they load from or discharge into river craft. The Witham and various canals connect Boston with Lincoln, Gainsborough, Nottingham, and Derby.

Its chief trade consists of exports of coal, iron and general cargoes, and an import of grain, seed, sleepers, mining timbers, &c.

There is a building-yard, and also a patent slip, and a gridiron. Forty to fifty years ago large vessels were built here, but now those constructed seldom exceed 100 tons burden.

Boston is connected with the Great Northern Railway ; and with Hull, London, and Wisbech, by steamer. 66 vessels of 3,513 tons belonged to the port 1st January 1881. The arrivals in 1880 were 471 vessels of 35,651 tons. Population, 18,330 in 1881.

**Supplies.**—General supplies are plentiful ; water of good quality has been led down from Keal hill, 12 miles distant, and the charge for it is moderate. Coals are readily obtained and vessels coaled in the dock by a hoist worked with hydraulic power. There is a good hospital in the Park close to the dock.

**Pilots.**—There are six Boston pilots ; their vessel is moored in Clay Hole, and pilotage is compulsory for merchant vessels.

Owing to the narrowness of the cut, a steam tug is usually employed, but vessels can sail either way with the wind from W.S.W. and E.N.E.

**TIDES.**—Spring tides rise 23 feet 4 inches at Clay Hole, and 13 feet 2 inches at Boston black sluice ; neaps range 9 feet 2 inches at Clay Hole, and 6 feet at Boston black sluice.

Off Boston bar, the flood-stream sets W.S.W., and the ebb E.N.E. ; both run strongly through the swatchways across Long sand when it is uncovered ; with this exception, the sets are generally fair up and down the Deep, and both streams cease at the time of high and low water upon the shore. At Clay Hole, springs rise 23 feet 4 inches, and neaps range 9 feet 2 inches, for which due allowance must be made when taking up an anchorage.

For Boston South channel, and Spalding, *see* pages 181 and 182.

## LYNN DEEP.

The extensive inlet between the sands fronting the coasts of Lincolnshire and Norfolk is known as Lynn Deep. Dogs Head, Long, and Roger, the sands which form the south-eastern boundary of Boston Deep, constitute also the north-western boundary of Lynn Deep ; they partly dry at low-water, and are, for the most part, very steep to the south-eastward ; this is especially the case about the Hook or elbow of Long sand. The sands are separated from each other by low-water swatchways, named the Parlour and Trap, passages well-known to coasters, but too obscure for a stranger to use. The south-eastern edges of these sands are not buoyed and consequently the north-western side of Lynn Deep should be avoided.

**LYNN KNOCK**, a shoal very much in the way of vessels bound up the Deep, lies abreast of, and nearly parallel to, the Dogs Head, the channel between them being a little more than one mile wide, with 5 and 6 fathoms in it. This shoal, upon which the depth is only 7 feet at low water, is steep-to on both sides and 2 miles long in a N. by E.  $\frac{3}{4}$  E. and S. by W.  $\frac{3}{4}$  W. direction. It is marked by two *black* buoys one mile apart.

**BUOYS.**—**North Lynn Knock**, a *conical* buoy, *black with staff and globe*, lies in  $6\frac{1}{2}$  fathoms on the east side of the shoal, with Burgh church, open northward of a house with a flagstaff, and in a gap of the sand-hills, N.W., and North Inner Dowsing buoy, N.E. by N., 13 miles.

**South Lynn Knock**, a *conical black* buoy, lies in  $4\frac{1}{2}$  fathoms on the south end of the shoal, with Hunstanton lighthouse, in line with the middle of a long wood, bearing S.  $\frac{1}{2}$  W., and Burgh church, N.W.  $\frac{1}{2}$  N.

**LYNN WELL**, a deep water trench or gulley, with 15 to 27 fathoms in it, occupying the centre of Lynn Deep, begins about E. by N. 3 miles from Lynn Knock, and running S.W. by W. for 10 miles, with an average width of three-quarters of a mile, ends  $1\frac{1}{2}$  mile above the Hook of Long sand. This trench serves, in misty weather, as a useful guide to vessels bound up Lynn Deep.

**A LIGHT VESSEL** moored in Lynn Well, in  $17\frac{1}{2}$  fathoms,  $1\frac{1}{2}$  mile outside the dry part of the Hook of Long sand, exhibits a *flashing white* light, showing a *flash every ten seconds*, 36 feet above the water, and visible in clear weather at the distance of



10 miles. The light-vessel, coloured *red*, carries a ball at the mast-head.

**Fog-signal.**—A gong is sounded during thick or foggy weather.

The vessel lies with Docking poorhouse, touching the south side of Ringstead windmill, bearing S.S.E.; a gap in Sedgeford wood, in line with Hunstanton terrace, S. by E.  $\frac{1}{4}$  E.; and Ingoldmells mill, open to the westward of Winthorpe church, N.  $\frac{1}{4}$  W.; Hunstanton lighthouse, S.  $\frac{3}{4}$  E., distant  $5\frac{1}{10}$  miles; Sunk buoy, S.S.W.  $\frac{1}{4}$  W. nearly 4 miles; South Lynn Knock buoy, N.N.E.  $\frac{1}{2}$  E.,  $3\frac{1}{2}$  miles; Docking buoy, N.E.  $\frac{3}{4}$  E., nearly 16 miles; Burnham Ridge buoy, N.E. by E., 8 miles; Burnham Flats buoy, N.E. by E.  $\frac{1}{2}$  E., 10 miles; outer buoy of the Roaring Middle, S.W. by W.  $\frac{1}{4}$  W., 6 miles; and the Roger buoy, at the entrance of Boston South channel, W. by S.  $\frac{3}{4}$  S.,  $8\frac{1}{2}$  miles.

The south-eastern side of the entrance to Lynn Deep is bounded by an extensive mass of shoals, projecting in a triangular form from the coast of Norfolk. To the eastward they are broken and irregular, gradually shelving into deeper water; but their north-western edge is well defined, and very steep, the lead, while passing over them, quickly falling from 2 fathoms into 7 or 10 fathoms.

**DOCKING SHOAL**, the north-easternmost of these dangers, lies more than 10 miles from the main abreast Ingoldmells point, and a channel 2 miles wide, with 13 and 14 fathoms in it, separates it from the ridge near the south tail of the Inner Dowsing. This shoal is triangular, and, considering a depth of 4 fathoms as its boundary, it extends from its south-western point 5 miles north-easterly, and 6 miles south-easterly. It nearly dries at its south-west end, and there are several one-fathom and 2-fathoms patches distributed over its irregular surface. Its three salient points are marked by buoys.

**BUOYS.**—**North-east Docking**, a *spherical* buoy, *striped horizontally black and white*, with *staff and two diamonds*, lies in  $9\frac{1}{2}$  fathoms near the north extremity of the Docking; from it, North Inner Dowsing buoy bears N.N.W.  $\frac{3}{4}$  W.,  $6\frac{1}{2}$  miles; South Inner Dowsing buoy, W.  $\frac{1}{4}$  S.,  $4\frac{1}{2}$  miles.

**West Docking**, a can buoy, *striped vertically black and white*, lies near the west end of Docking shoal in 6 fathoms; with Burnham Flats buoy bearing W.S.W., distant 9 cables; South Inner Dowsing buoy, N. by W.  $\frac{1}{4}$  W., 4 miles.

**S.E. Docking**, a *chequered black and white* can buoy, lies in

4½ fathoms at the south-east extremity of the Docking shoal, with Blakeney church bearing S. by E.  $\frac{3}{4}$  E., distant 13 miles; and Ringstead mill S.W. by W.  $\frac{1}{2}$  W., 14½ miles.

**BURNHAM RIDGE**, a small shoal conforming in its direction to the north-west margin of Burnham Flats, and lying one mile to the westward of the portion which dries near their north end, is about 1½ mile long, and one-quarter of a mile wide; the least depth on the shoal is 3 fathoms, and there are 7 and 10 fathoms close to on either side.

**Buoy**.—A *chequered black and white* can buoy lies half a mile to the north-west of the Ridge, in 8 fathoms; with Ringstead windmill, in line with Holme church, bearing S.S.W.  $\frac{1}{4}$  W.; and Burnham Norton church, over the middle of the high part of the Scald head, S.  $\frac{7}{8}$  E.

**BURNHAM FLATS**, to the south-west of the Docking shoal, and separated from it by a swatchway three quarters of a mile wide, with a low-water depth of 4 to 6 fathoms in it, are connected with the shore of Norfolk; the north-west side, as in the case of the Docking, is steep, while the surface is very irregular, the depths being only one foot to 6 feet over a considerable portion, whilst at the north end the sand dries one foot for a third of a mile at low-water.

**Buoy**.—A spherical buoy *striped horizontally black and white*, with staff and St. Andrew's cross, lies in 10 fathoms, at the north-east extremity of the flats, and marks the south-west boundary of the swatchway. At it, Addlethorpe church is open thrice its length to the northward of Ingoldmells church, bearing N.W.  $\frac{7}{8}$  W., and Hunstanton lighthouse bears S.W.  $\frac{1}{2}$  S., distant 12½ miles.

**WOOLPACK, MIDDLE, and SUNK**.—From the swatchway, the steep north-western face of Burnham flats (slightly concaved) extends S.W. by W. for 13½ miles, and then turning abruptly to the southward, joins the shoals upon the shore of Norfolk at the head of Lynn Deep. The Woolpack, with one foot over it, and the Middle, and Sunk, which dry at low-water 10 and 6 feet, are upon and near the edge of the flats.

**Buoys**.—A can buoy, *chequered black and white*, lies to the westward of the western spit of the Woolpack, in 5½ fathoms; with Hunstanton church, in line with the centre of the new church at St. Edmunds, bearing S.S.W.; Holkham church, S.E.

A can buoy, *striped vertically black and white*, lies near the south-west

end of the South Sunk, and serves, with Gore Middle buoy (described on page 184) to lead through Gore channel or Bays, a narrow passage between Burnham flats and the shore, portions of which are almost dry at low water. From the Sunk buoy Hunstanton lighthouse bears S.E. by E.  $\frac{1}{2}$  E. nearly 3 miles, and Snettisham church spire S. by E.  $\frac{1}{2}$  E. 6 miles.

**FERRIER OUTER MIDDLE**, a sand patch upon the edge of the flats, to the south-westward of the Sunk, is marked by a can buoy, *striped vertically black and white*, from which Hunstanton light bears east (southerly) 3 miles and Sunk buoy N. by E.  $\frac{1}{2}$  E.  $1\frac{1}{2}$  miles, while the buoys at the entrance of Bull-dog channel lie  $1\frac{1}{2}$  mile to the south-westward; but further notice of them is unnecessary, as they are out of the way of the main navigation.

The **HEAD of LYNN DEEP** is occupied by extensive sands, mostly trending to the north-eastward; they are separated from each other by narrow channels, the remains of former outlets of the Ouse, the river having gradually worked its way to the westward. The Ferrier, Pandora, Daseley, Seal, Thief, and other sands, dry in places 8 to 11 feet. The Roaring, Middle and Whiting, the westernmost of this group of sands, form together the south-east boundary of the approach to Lynn channel and road. The Thief is marked by a life-beacon near its south-west elbow.

**Middle.**—A patch of 18 feet, lying half a mile N.E. by E. from the outer buoy of the Roaring Middle, and S.W. by W. 5 miles from Lynn Well light-vessel, is what remains of Middle bank.

**Roaring Middle**, a narrow bank that dries at low water to the extent of one mile, lies in a S.W.  $\frac{1}{4}$  W. and N.E.  $\frac{1}{4}$  E. direction and is connected to the Whiting.

**Buoys.**—A large nun buoy, *striped vertically black and white*, with a staff and ball, lies in 5 fathoms, near its north-east end; with Ringstead windmill, in line with the largest white mark upon the face of the west end of Hunstanton cliff, bearing E. by S.  $\frac{3}{4}$  S.; and Boston church, open a little to the westward of Freiston church, N.W. by W.  $\frac{3}{4}$  W. The light at Hunstanton shows *red* between the bearings S.E. by E.  $\frac{1}{4}$  E. and E. by S.  $\frac{3}{4}$  S. The north-west side of the Roaring Middle is afterwards marked by a tall nine-pin buoy, and by two can buoys; *they are striped vertically black and white*, and are numbered upwards 1, 2, and 3, respectively, No. 3 lying S.E. by E.  $\frac{1}{2}$  E., half a mile from Wisbeach bar buoy.

**Whiting** is in continuation from the Roaring Middle to the south-westward, and the greater portion of it dries at low-water springs. It bends gradually round from the south-west to the southward, its inner or south-western face forming the north-eastern boundary of Lynn road. A life-beacon\* was erected in 1812 upon this sand, and it is further marked by several *black* and *white vertically striped* buoys, following in continuation those upon the Roaring Middle; and by the Elbow and another beacon.

The shoals bounding the approaches to Lynn, Wisbeach, and Boston, will be noticed under the heads of the several ports.

**DIRECTIONS.**—In navigating the Wash it is necessary to remember that the tidal streams are strong, the rise and fall of the tide considerable (nearly four fathoms), and the weather frequently misty. The use of the lead, therefore, should never be neglected, and the state of the tide always taken into consideration, remembering that at half tide the depth will always be from 11 to 12 feet more than shown on the chart; whilst at other times the height of the tide can always be calculated to within a small amount by means of the table given in the annual edition of the Admiralty tide tables. In very clear weather, Ingoldmells mill, the houses at Skegness, Freiston and Boston churches, are all conspicuous on the Lincolnshire coast, whilst Snettisham church, Hunstanton lighthouse, Ringstead mill, Holme church, Scald head, and Brancaster mill, are equally conspicuous on the Norfolk coast. Three channels into the Wash or Lynn Deep are mostly used; (a) that between the coast of Lincolnshire and Inner Dowsing shoal by vessels from the northward; (b) that between Inner Dowsing and Docking sands, and (c) that between Burnham flats and the Docking by vessels from the eastward. A fourth channel close to the coast of Norfolk is available for vessels of light draught at high water.

The channel to the westward of Lynn Knock cannot be recommended as safe, for it is narrow; a strong in-draught into Boston Deep sets across it, and no good marks can be given.

The swatchway between Docking shoal and Burnham flats is N.W.  $\frac{1}{3}$  W., 15 miles from the bell buoy at the east end of Blakeney Overfalls. Addlethorpe church tower, open four times its breadth to

\* There are life-beacons upon several of the sands seaward of Lynn road; they are shifted occasionally as the sands alter in form and height.

The beacon on Whiting sand has been knocked down, and is temporarily replaced by a green nun buoy. This beacon will not be re-erected, but a bell buoy will eventually be moored near the position.

the northward of the tower of Ingoldmells church, bearing N.W.  $\frac{3}{4}$  W., leads through close to the beacon buoy upon Burnham flats.

Snettisham spire (*see* view, page 183), in line with Hunstanton lighthouse, bearing S. by W., leads to the eastward of the sands forming Boston bar, and also of Lynn Knock.

Pass to the south-eastward of Lynn Well light-vessel whether running or working, and keep her to the westward of S.W. while closing her, and E.N.E., after she has been passed, for about  $5\frac{1}{2}$  miles, when Hunstanton lighthouse will bear S.E. by E.  $\frac{1}{2}$  E., and the course to Bar Flat light-vessel at the entrance of Lynn channel is S.W. From Lynn Well light-vessel, the north-east buoy of the Roaring Middle bears S.W. by W.  $\frac{1}{4}$  W., distant 6 miles.

**By Night**, vessels pursuing the track between the Inner Dowsing and the coast of Lincolnshire, usually keep in a depth of 5 or 6 fathoms, and steer the coasting course ; and when the water deepens to 8 or 9 fathoms, the Well will be opening and Hunstanton light will probably be in sight. This must be kept bearing S. by W.  $\frac{1}{2}$  W. until Lynn Well light appears S.W., the proper bearing for closing her ; pass to the south-eastward of the light-vessel, and keep her bearing E.N.E. until the colour of Hunstanton light changes from *white* to *red*, when the usual night anchorage in from 10 to 12 fathoms will have been reached, from whence the light-vessel at the entrance of Lynn channel bears S.W., distant 3 miles.

**CAUTION.**—As the bottom in Lynn Deep is irregular, and the tide-streams are rapid, a careful attention to clearing marks and bearings is absolutely essential, as well as a frequent use of the lead. Owing to a neglect of these precautions, vessels from the coast of Lincolnshire bound to Lynn have crossed the Deep, and become wrecked upon the shore of Norfolk. A depth of 9 fathoms leads outside Lynn Knock, when a S.W. course made good will insure the Well light-vessel being sighted.

It must also be borne in mind that the flood stream sets through the swatchways into Boston Deep at the rate of  $4\frac{1}{2}$  knots at springs, and  $2\frac{1}{2}$  knots at neaps, from anywhere near Lynn Knock or the Hook of Long sand. Also, from neglecting the bearing of Lynn Well light, while running up the Deep, several vessels have become wrecked upon the east side of the Roaring Middle.

**TIDAL STREAMS.**—The set of the tidal streams in Lynn Deep is various. Between the Docking and Inner Dowsing the direction of the first of the flood is S.W., it then gradually draws towards

W. by S. until high-water. Outside the Docking and Dowsing there are rotatory tides which never slack, and which run during springs at an average rate of  $2\frac{1}{2}$  knots per hour—first-quarter flood setting S.E., half-flood S.W., last-quarter flood and first-quarter ebb, West to N.N.W., and half-ebb to low-water, N.E. to E.S.E. Near the Woolpack and Sunk the flood sets W.S.W., and the ebb E.N.E.; while from the Sunk along the south-east side of the Deep, they are, respectively, S.W. and N.E. At Lynn Knock, and the Hook of Long sand, the flood sets W. by S., and the ebb E. by N. In the body of the Deep above the Well light-vessel, the general sets are W.S.W. and E.N.E., and the farther to the westward the more westerly is the set; this is due to the in-draught through the swathways of Long sand before alluded to. The rise of the tide in the Deep, also, is so considerable that caution is necessary to make due allowance for it when taking up an anchorage.

Directions for Lynn channel, and Lynn, are on pages 176 and 177, and those for Wisbech channel, and Wisbech, are on pages 179 and 180.

### HEAD OF THE WASH.

**LYNN CHANNEL**, leading to Lynn road, has the Roaring Middle and Whiting to the eastward, and Wisbech Middle and Westmark Knock to the westward.

**Buoys.**—The buoys marking the Roaring Middle and Whiting have already been described on pages 172, 173. On the west side there is first the Bar buoy, a *red* can with staff and ball, S.W. by W.,  $3\frac{1}{6}$  miles from the outer buoy of the Roaring Middle. The channel to Wisbech is on either side of this buoy, and then the eastern side of Westmark Knock up to Lynn road, is further defined at short intervals by *black* buoys.

**BAR FLAT LIGHT - VESSEL.**—A light-vessel, with the words *Bar Flat* on her sides, and carrying a globe at the mast-head, is moored in  $3\frac{1}{2}$  fathoms at low-water, spring tides, off the north-east end of Wisbech bar flat, west side of Lynn channel entrance; she exhibits at 38 feet above the sea a *fixed white* light.

**Fog Signal.**—During thick or foggy weather a gun is fired and a gong is sounded.

From the light-vessel, Roaring Middle buoy bears E.N.E., distant  $2\frac{1}{4}$  miles; Buoy, No. 1, E.  $\frac{1}{4}$  S.,  $1\frac{1}{6}$  miles; Buoy, No. 2, S.E. by S.,

8 cables ; Outer Gat buoy, N.W.  $\frac{1}{2}$  N.,  $1\frac{3}{10}$  miles ; and Lynn Well light-vessel, N.E. by E.  $\frac{1}{2}$  E., 8 miles.

**DIRECTIONS.**—Lynn channel, which is little more than one-quarter of a mile in width, has from 8 to 5 fathoms in it at low-water ; with the exception of Wisbech bar buoy, it is marked by *black* buoys on the westward, and *black* and *white vertically striped* buoys on the eastward side of the channel ; or *black* buoys on the *starboard* hand in entering, and *black* and *white* buoys on the *port* hand. The land within view is so low, and bare of available objects, that no marks can be given for navigating the channel, but the tide sets fairly through it, and the buoys are closely placed. Having arrived abreast the outer end of the Roaring Middle, the course will be S.W., changing gradually at the Whiting to S.W.  $\frac{1}{4}$  S., S.S.W.  $\frac{3}{4}$  W., and S.  $\frac{3}{4}$  W.

**CAUTION.**—No vessel should enter Lynn channel at night, except under the guidance of a pilot ; for, owing to not keeping near the edge of the Roaring Middle while working, several wrecks have taken place in the blind channel behind Wisbech Middle.

**LYNN ROAD.**—The best anchorage in Lynn road is from a short berth to the southward of the Whiting buoys to abreast the Thief and Hull beacons, in 3 fathoms, over mud, sand, and clay, in which the anchors hold well. This road is much exposed in northerly gales, but vessels then anchor in about the same depth at Lloyd's Middle, from one to one and a half miles farther up, where, though the space is limited, better shelter is afforded by the sands in gales from N.W. to E.N.E.

**Bull-dog Channel.**—One of the old outlets of the river Ouse has opened out at its inner end of late years, and is marked by *black* and *white vertically striped* buoys on the eastward or *port* side, and *black* buoys on the westward or *starboard* side in entering, in addition to several beacons. It is frequented by the small fishing vessels and coasters of the district, and is occasionally used by vessels of light draught from Lynn, bound North, in scant easterly winds, as it enables them to keep under the weather shore, and to clear the sands abreast Boston bar, when it could not be done by vessels passing out of Lynn channel. No marks for the Bull-Dog channel can be given, and no strangers should attempt to pass through it.

**Pilots.**—The pilot service of Lynn is performed by 13 pilots, in a cutter, under the direction of a headman. The vessel is always under-

way in Lynn channel after half-flood, but on other occasions she rides near the Roadstead buoy at the upper end of the Whiting. She carries a light during dark tides. The usual boarding place is near the Elbow Beacon, but the pilots will proceed lower if required; the extra charge for so doing being moderate, and in proportion to the distance.

**TIDES.**—A spring tide, which rises 23 feet 3 inches in Lynn road, rises 22 feet 5 inches at Lynn; the wind, however, has a great effect upon the tides.

**LYNN** was in existence before the Conquest, and was named Lynn Regis, or King's Lynn, for its distinguished loyalty to King John. Seated upon the right bank of the Ouse, a little within its outfall, and 8 miles above Lynn road, it extends along the river for  $1\frac{1}{2}$  miles; a finely wooded country rises behind it in gentle eminences, and in front of it is a flat alluvial district. Owing to the low situation of the town, the two towers of St. Margaret's church, the spire of St. Nicholas, the old tower of Grey Friars monastery, and the tall chimney of a flax mill, are all that can be seen of it from the sea.

The outfall of the Ouse has undergone many remarkable changes. Originally it was on the Norfolk shore, occupying what is still termed the Old channel. In 1773 it shifted  $1\frac{1}{2}$  miles to the westward to the Bull-dog channel, where it remained until 1812, when it again moved 4 miles more westerly to its present position.

Considerable alteration has been made of late years in the channel of the Ouse below Lynn. In 1846 an Act was obtained for enclosing 32,000 acres of the Wash, and for substituting, in place of the tortuous river-course below the town, a straight cut 8 miles long, extending from Lynn across the marshes and through the sands down to Lynn road. Nearly  $2\frac{1}{2}$  miles of this cut has been executed, and an amended Act obtained in 1857 limits it to 4 miles in length. At the south end of it, near Lynn, the high and low water breadths are, respectively, 485 and 320 feet, which increase about 15 feet per mile towards the north or sea end. The depth in the cut at low-water, ordinary springs, is 7 to 18 feet.

The channel from Lynn road to the entrance is well beaconed, and marked by *black* buoys on the westward or *starboard* side in entering, and *black* and *white vertically striped* buoys on the eastward or *port* side; but in consequence of its changeable character, the dearth of marks, and the cross-tide sets (particularly at the upper end), the aid of a pilot is indispensable.



**LIGHTS.**—Two *white* leading lights, S.  $\frac{1}{4}$  E. and N.  $\frac{1}{4}$  W., 185 yards apart, are exhibited on the east side of, and about one mile from the lower end of, the cut, to enable vessels to enter at night, and those of light draught to proceed to the harbour. They should be seen in clear weather 5 miles.

Excellent moorings were laid down in Lynn harbour in 1841 for twenty tiers of vessels, with room for six vessels in each tier, but these moorings have been reduced in number since the opening of the docks. At low-water there is a depth of 6 feet generally over the harbour, but several of the berths have 10 and 12 feet. In consequence of the light and shifting nature of the sand, vessels lie rather irregularly upon the ground for the first tide, and are often strained.

**Docks.**—The Alexandra dock, of  $6\frac{1}{4}$  acres, at the north end of the town, was opened in 1869. The entrance lock is 192 feet long between the gates, and 50 feet wide, with a depth of 2 feet 3 inches over the sill at low-water of spring tides, and 25 feet at high-water. The Bentinck dock, inside the Alexandra, opened in 1884, is  $9\frac{1}{2}$  acres in extent, 1,000 feet long and 400 feet wide, with  $27\frac{1}{2}$  feet over the sill at high-water. The lock connecting the two docks is 300 feet long and 50 feet wide.

Vessels of 20 feet draught can reach the town during springs, and those of 14 feet at neap tides. With a foul wind, vessels bound to Lynn weigh from the road at quarter-flood, and with a fair wind at half-flood.

Prior to the opening of the Eau brink cut, in 1821, the alluvial soil deposited in front of the granaries on the east side of the harbour formed a natural quay, which has been extended and piled, and is 1,041 feet in length, by 26 feet in width. There is a powerful crane, and two steam machines for discharging colliers; tramways are laid along these quays communicating immediately with the Great Eastern and other railways.

The chief trade of Lynn is in oil cake and Baltic produce, and corn and coal coastwise; it is at times very considerable, owing to the port having a ready communication with eight contiguous counties; there is also a large export of coprolites. The jurisdiction of its custom-house extends to Brancaster on the Norfolk coast, and to Sutton sluice on the Lincolnshire shore. There are two building-yards, and a patent slip capable of taking up a vessel of about 600 tons register; but ship-building is not carried on to any material extent.

In 1880 the arrivals were 1,204 vessels of 193,223 tons.

The population of Lynn in 1881 was 18,475.

**Supplies** for shipping are plentiful, and water may be obtained at the Marine parade, and at many other places. Coal is easily procured, and vessels readily coaled in the docks. All ordinary repairs to hull and machinery can be executed. There is a hospital in the town.

**WISBECH CHANNEL** leaves Lynn channel at the Bar buoy—a *red* can with a staff and ball. It is formed between Wisbech Middle on the west or *starboârd* hand in entering, and Westmark Knock on the east or *port* hand, which sands dry at low-water. The Bar buoy bears S.W. by W., distant  $3\frac{1}{10}$  miles from the outer buoy of the Roaring Middle; and S.W.,  $1\frac{1}{2}$  miles from Bar flat light-vessel, and may be passed on either hand. The channel up to the anchorage in Wisbech road is marked by seven *red* buoys, and Bachelor beacon along the Middle and adjoining flat, or on the *starboard* side of the channel in entering, and by *red* and *white vertically striped* buoys upon the western side of Westmark Knock, or on the *port* hand in entering. There is also a life-beacon upon the Westmark Knock, one and a quarter miles W. by S.  $\frac{1}{2}$  S. from the Bar buoy. From the road to the embankments of the cut, the channel, which is subject to change, is marked for some distance by *red* buoys on the *starboard* hand, and *red* and *white vertically striped* buoys on the *port* hand, and then by basket and brush beacons. The channel is lighted during dark tides in the winter.

There is a depth of only 9 feet at low-water into Wisbech channel, but within the bar it quickly increases to 3 and 4 fathoms, and the buoys on either side the channel will be sufficient guide up to the road, 2 miles above the bar. A berth should be taken up in the deep water near the third *red* and *white* buoy, in from 7 to 9 fathoms.

**Pilots.**—There are six Wisbech pilots under a master; they board at the road; but pilotage is not compulsory, and the consequence is that they meet with little encouragement.

**WISBECH**, or Wisbeach, is on the river Nene, 12 miles above its outlet, and 16 miles above Wisbech road. The town, which is ancient, and the largest in the Isle of Ely, is the principal market town in this part of the county, the corn market is important and quantities of grain are annually exported. The Wisbech canal connects the Nene with the Ouse. The town stands upon both banks of the river, which formerly was here crossed by a stone bridge built in 1760.

This bridge acted as a serious obstruction to the flow of the tide, and to the discharge of the land waters, and an iron bridge has been substituted; it was opened for traffic on the 9th November 1857.

As late as 1827, vessels of 60 tons only could reach the town with the best spring tide, and the arrival of a vessel of 100 tons was the cause of rejoicing; but in that year an Act was obtained for improving the outfall of the Nene, the town contributing 30,000*l.* towards the expense. Between 1827 and 1830 the greater part of the navigation from Wisbech to the sea was improved, straightened, and deepened, and a new cut was made so as to avoid the old and uncertain channel through Cross-keys Wash. Extensive works, consisting of new wharfing, have also been executed in the town, so that now vessels of 500 tons can enter the port.

The Midland Railway Company has a coal-drop at Wisbech, in connection with the river; and there is also a branch line of the Great Eastern Railway.

**Sutton Bridge.**—Three miles above the outfall the navigation is crossed by Sutton bridge. The original bridge was built on piles, with a central waterway 45 feet broad; but stones which were thrown down to defend the bridge, caused eddies and deep holes that rendered the passage through it somewhat difficult; the bridge was, besides, a serious obstruction to the stream, for the fall which it occasioned at half-ebb amounted to 3 feet in a distance of 100 yards. In 1849-50 a revolving iron bridge, with two openings, each of 60 feet width, was erected close to the old bridge, which with its bank of stones was taken away. There is a line of quays below the bridge on the west side, at which the heaviest vessels using the port sometimes discharge. The general width of the cut above and below the bridge is 120 feet, and the former points of the outlet are marked by two beacon towers.

**Sutton Bridge Dock.**—A dock has been constructed on the west side of the Nene about  $2\frac{1}{2}$  miles above the towers at the entrance of the river. The dock is 1,415 feet long, 400 feet wide, and has an area of 13 acres; the entrance to it is 50 feet in width, and the depth of water over the sill at high-water ordinary springs is 24 feet, and at low-water about 5 feet. The average depth of water in the dock being 20 feet. The dock is entered by a lock 190 feet long and 50 feet wide. It was opened in May, 1881, but the foundation of the river wall shortly after proved to be defective, and the dock cannot be used until it is repaired.

Works, under the direction of the Commissioners of the Nene outfall, are in progress for straightening and improving those parts of the channel not under the operation of the Act passed in 1827. Vessels usually tow up from the road. The navigation is free of shoals.

Corn is exported, as well as coals, hay and straw, salt, and coprolites. The imports are timber, cake, coal, seeds, and grain. Some minor manufactures are carried on ; there is one yard for repairing vessels and building small river craft and a patent slip. 26 vessels of 4,715 tons belonged to the port on the 1st January 1881. In 1880 the arrivals were 727 vessels of 65,151 tons. The population in 1881 amounted to 9,248.

**TIDES.**—The tide is rapid during springs, but with freshets, the neap flood sometimes does not reach the town. Common springs rise 20 feet 6 inches at Sutton bridge, and 15 feet 2 inches at Wisbech. The flood-stream runs for 4 hours at Sutton bridge, and for 3 hours at Wisbech.

**BOSTON GAT**, or South channel, to Boston, so named in contradistinction to the North channel, or Boston Deep, described on pages 164 to 168 is formed by Gat sand to the southward, and the Roger sand to the northward ; its entrance bears W.  $\frac{1}{2}$  N., distant 3 miles from Roaring Middle outer buoy, and N.  $\frac{1}{2}$  E.,  $2\frac{1}{4}$  miles from Wisbech bar buoy. This passage, tortuous and subject to frequent change, is used only by small vessels from Lynn or Wisbech bound to Boston, or by those taking the inner passage along the shore of Norfolk and through the Bays.

Boston South, or Gat, channel, steep-to on both sides, and for the most part only one-quarter of a mile wide, is marked by two *black* and *white vertically striped* buoys, Outer and Inner Gat, and by Gat beacon on the *port* hand ; and on the *starboard side*, by the Roger *black* buoy at the entrance, two *black* buoys on the South side of the Roger sand and Toft beacon at the western end of the Roger. At the entrance the depths are 16 and 17 feet at low-water, but quickly increase to 4 and 5 fathoms within the bar. By the Toft beacon a narrow swatchway divides the Roger sand which is marked by buoys.\*

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\* During the winter of 1887-8, and again in the winter of 1888-9, the Boston ga had 2 lights exhibited in it ; but as they were different each winter, and it has not yet been decided whether they are to be permanently exhibited, it is useless to describe them here.

**DIRECTIONS.**—Having arrived midway between the Roger and Outer Gat buoys, the course is W.  $\frac{3}{4}$  N. for three-quarters of a mile to abreast the Inner Gat buoy, then steer W.N.W. (northerly) for  $1\frac{1}{4}$  mile, in mid-channel, and having passed 2 cables to the northward of Gat beacon a W.  $\frac{1}{2}$  N. course for  $1\frac{1}{2}$  mile will take to abreast Toft beacon, beyond which the channel divides, one branch turning to the northward into Boston Deep, the other, trending to the south-west and then to the westward, joins the main stream of the Witham. Both passages are crooked and shallow, and though buoyed, are too intricate to be used by a stranger. Vessels, therefore, having arrived at Toft beacon, should, if bound to Boston, hoist the usual pilot signal; but if bound to Fossdyke bridge, or Spalding, the pilot jack below a burgee at the fore-topmast-head is the signal for a pilot.

**SPALDING** is upon the river Welland, 12 miles above its junction with the Witham.

The navigation of the Welland is still very defective, particularly at the Reservoir, where a double elbow somewhat interferes with the passage of the tide. During the summer the river is also much encumbered with deposit brought in by the flood, and the width, which averages 120 feet from Fossdyke bridge to the Reservoir, decreases to 60 or 70 feet from thence to Spalding. Vessels of 7 feet draught reach Spalding at spring tides, and they are towed up by horses.

Vessels of burden discharge at Fossdyke bridge, which crosses the Welland 8 miles below the town; it is built on piles, and has a waterway of 28 feet. As late as 1835, vessels drawing 6 feet could with difficulty reach the bridge on spring tides, but since that time a plan of improvement has been acted upon; the outfall of the Welland, marked on either side by basket and brush beacons, has been carried, by a system of faggot work, in a straight direction through the Wash, and now vessels drawing 12 feet reach the bridge during spring tides, and those of 6 feet at neaps.

Spalding is a creek to Boston custom-house. The arrivals at Spalding and Fossdyke bridge in 1880 were 70 vessels of 3,025 tons. Population, 9,260 in 1881.

**Pilots.**—A pilot-vessel lies in the mouth of the Outfall, 4 miles below Fossdyke bridge; there are two pilots, but pilotage is not compulsory. The channel is well lighted in the winter season.

**COAST.**—The coast on the Eastern or Norfolk side of the Wash from Lynn Regis to Gore point is moderately elevated, and the sharp spire of Snettisham church, Hunstanton lighthouse, the new watering-place of Hunstanton, Ringstead mill, and Holme church, are points all readily recognised in moderately clear weather.



Snettisham spire, S.S.E., 2 miles.

**Hunstanton.**—The new watering-place of Hunstanton stands near the south-west end of a line of cliff which breaks the monotony of the flat marshy land on each side. This cliff is not only striking from its being the only one in the vicinity, but also from its sharp contrasts of colours being of grey chalk marl, which contains a plentiful supply of organic remains, and a red chalk peculiar to the eastern counties. Amber and jet are found on the coast here, as well as remains of forests, now submerged, indicating the much greater extent of the land formerly. A railway connects Hunstanton with Lynn Regis, Docking, and Wells. From the new village a pier extends out some little distance, but its end is dry at low-water. Off Hunstanton cliff there is a ditch nearly half a mile in width, with depths of from 8 to 20 feet at low water, where small vessels occasionally anchor, and which is protected by the surrounding sand-banks, but no good marks can be given for it.

A Life-Boat is stationed here.

**HUNSTANTON LIGHTHOUSE** (*see* view on chart, No. 1455) is upon the middle, or highest part, of the cliff, 60 feet above high-water, and was built in 1840 to replace one of wood. The light is *occulting*, giving *two occultations* in quick succession *every half minute* as follows :—eclipse *two seconds*, light *two seconds*, eclipse *two seconds*, light *twenty-four seconds* ; the light is *white*, except between the bearings S.E. by E.  $\frac{1}{4}$  E. and E. by S.  $\frac{3}{4}$  S., or from the direction of the outer buoy of the Roaring Middle, when it shows *red* ; it is elevated 109 feet above high-water, and may be seen 16 miles off in clear weather.

Thornham, Hunstanton, Heacham, and Snettisham are creeks and out-stations of Lynn custom-house ; about 90 vessels, with coal and oil-cake, frequent these places.

**BAYS or GORE CHANNEL.**—Vessels of light draught bound to Lynn or Boston Deepes with south or south-westerly winds generally

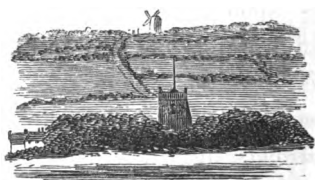
prefer this inner channel between Burnham flats and the Norfolk coast, to that between the flats and the Docking. It is narrow, shallow, uneven, and intricate, having the Middle and Sunk to the northward, and Gore and Hunstanton points to the southward. It is, however, nearly a mile wide at its broadest part, and has there a depth of 11 to 17 feet at low-water, and as the channel is well protected from northerly winds by the Middle bank, small vessels occasionally anchor here. The best marks are Ringstead mill, South to S. by W., and Gore Middle buoy, East.

**Gore Middle Buoy.**—A *red* conical buoy with staff and globe, marked *Gore Middle*, lies in 14 feet, at the east end of Gore Middle sand, the eastern portion of Middle bank ; with Holme church, twice its length, eastward of a large barn, bearing S.W.  $\frac{1}{2}$  S. ; and Docking church, just open eastward of a roadway at Thornham, South.

**DIRECTIONS.**—From its direction being parallel to the coast, no clearing or sailing marks of any particular use can be given ; but vessels having arrived as far as Brancaster road should steer so as to pass to southward of Gore Middle buoy, keeping about  $1\frac{1}{2}$  mile from the shore until abreast Hunstanton point, when the lighthouse kept S.E. by E. will lead into Lynn Deep. In this track the lead is of little use, on account of the uneven character of the bottom.

Besides the foregoing, there are several other passages into Lynn Deep between the Woolpack, Middle, and Sunk, which are occasionally used by coasters and other small craft familiar with the locality.

**The COAST.**—From Hunstanton sand-hills continue to Brancaster ; they are fronted by clay and stones, which dry out for some distance at low-water ; behind appear in succession Holme church, a plain and prominent object ; the fine old church of Thornham, with its ruined tower ; the square tower of Brancaster church among trees, and a white windmill on the outline above it. Holme hall is a large red brick house at the west end of a wood showing upon the outline a short distance from Brancaster down, and is a very plain object. Titchwell church has a tower with a slender spire ; there is a conspicuous life-boat house on the coast in front of Brancaster. Brancaster and



Brancaster church, S. by W.  $\frac{1}{4}$  W., 2 miles.



Thornham Church, S. by W.  $\frac{1}{4}$  W., 2 miles.

Ringstead windmills (the former white and the latter with six fans) also stand boldly forward, and the whole range is elevated and moderately wooded.

**THORNHAM**, a small and indifferent harbour, is formed by a creek, the channel of which crosses a broad sandy foreshore and is constantly varying in direction and depth. At springs, vessels drawing 9 feet reach Thornham staith upwards of one mile from the entrance; but, at neaps, there is only water for half that draught. The channel is occasionally sluiced out at low-water.

**Buoys.**—The entrance channel is marked by *black* buoys to the westward, and *white* buoys to the eastward, but it is very intricate.

**BRANCASTER HARBOUR**, 4 miles east of Gore point, 6 miles to the westward of Wells harbour, and 3 miles from that of Burnham Overy, is in front of Brancaster down, with its entrance more than one mile to the westward of Scald head; the sand here dries out at low water one mile from the main, and must be carefully avoided. This small harbour is formed by the inlet of a salt-water creek which enters the flat fore-shore in a general southerly direction and then divides; one branch running eastward to Burnham Overy, and the other westward to Brancaster staith and village.

The channel is marked by *black* buoys and standing beacons on the west side, and by *white* buoys on the east side, and has a winding course to the staith, where is a depth of 9 feet on a common spring-tide.

There are no regular pilots, but assistance may be obtained by hoisting the usual pilot signal. A flagstaff stands upon the hill above the staith, and a ball or basket hoisted halfway up denotes that assistance is ready; and wholly up, that there is water enough over the bar to enter.

At Brancaster staith, vessels lie snugly in a dock near a large dis-used granary, which is a very prominent object from the sea. The trade was at one time considerable, but it is now confined to imports of coal and linseed cake, and to exports of corn and wool.

**A Life-Boat** is stationed at Brancaster.

**BRANCASTER ROAD**, in front of the harbour, is formed between the Brid Girdle to the eastward and north-eastward, Burnham flats to the northward, and the Middle to the westward. It is 4 miles in length by about one mile in width, with depths of 3 and



3½ fathoms at low-water ; the bottom is a stiff clay. When taking up an anchorage here, due allowance must be made for the rise and fall of tide, amounting to 19 and 20 feet on springs, and 11 feet at neaps. The anchoring marks are, Holkham church, just open of Scald head, bearing S.E. ½ S. ; and the west end of Brancaster down, over the granary at Brancaster staith, S. by W. ¾ W.

There is good riding in Brancaster road at all times, but vessels must be well found in ground tackling, as the sea in the whole of the outer part of the anchorage breaks in on-shore gales.

**Scald Head** is a remarkable long sand hill on the coast to the eastward of Brancaster, from thence sand-hills continue to the eastward to Burnham Overy harbour. The background from Burnham Overy retires a mile or two, and 2 miles within Scald head is Deepdale or Brancaster down, of a higher elevation than the land about it, and clothed with wood.

**TIDAL STREAM.**—The flood is said to split in the offing abreast Scald head ; one portion running to the eastward until 3 hours after high-water, and the other to the westward till one hour before high-water upon the shore.

**BRIDE GIRDLE**, or Bridgirdle, lies abreast Burnham Overy, between Holkham bay and Brancaster road, and is connected by a narrow neck with 4 feet over it to the shore flat ; one portion three-quarters of a mile from the shore dries at low-water springs, and numerous 4 and 5 feet patches extend to the north-westward for upwards of one mile. From the outer end of the dry portion of the shoal, Wells fairway buoy bears S.E. by E. ⅓ E., distant 2¾ miles ; and the north-west extremity of Scald head, W. ½ S., nearly 2 miles.

**Buoy.**—A *chequered red and white* can buoy with staff and cage lies in 4½ fathoms, northward of all the shoal patches of the Bridgirdle ; with a roadway, in line with the middle of High Scald head, bearing S.W. ¼ W. ; and the Scalp beacon (Wells harbour), in line with the south end of Stiffkey wood, S.E. ½ S.

Holkham church and obelisk in line, bearing South, clears the Bridgirdle, passing to the eastward ; and Brancaster windmill, well open of Scald head, S.W. ½ W., clears the shoal part of the sand, passing to the north-westward, and leads into Brancaster road in 12 feet at low-water.

**BURNHAM OVERY.**—The small harbour of Burnham Overy

on the west side of Holkham bay, and 3 miles from Wells harbour, is formed by the inlet of a tidal creek 3 miles long, assisted by the drainage of the marsh lands on either side of it. Until 1838, the channel outside the meals or sand-hills took an easterly direction across the flat foreshore, but in that year, the present channel, which formed to the north-eastward, was rendered permanent by a breakwater or groyne on the east side, formed of stones, faggots, and wicker-work.

At common springs, there is a depth of 9 feet, and at neaps of 4 feet, up to Burnham Overy staith, the common discharging place,  $1\frac{1}{2}$  mile within the bar. The position of the breakwater, which is covered at a few feet flow, is marked by floating spars with vanes, and the west side of the channel by four small *black* buoys, and a beacon with a *black* ball. As the channel is nearly straight, temporary lights are used, and vessels frequently enter and leave it at night in fine weather. A flagstaff stands upon Cape hill, the extremity of the eastern sand-hills, and on this a ball or basket is hoisted when there is the proper depth over the bar for the vessel in the offing.

There is a private quay at the staith, as well as several docks or slips, in which the vessels lie securely while discharging. The trade is principally in exports of corn and flour, and imports of coal and oil-cake.

**HOLKHAM BAY** is used as a temporary anchorage by vessels waiting tide to enter Wells harbour. The best position is in 4 or  $4\frac{1}{2}$  fathoms, with Deepdale or Brancaster down over the first sand-hill to the westward of Burnham Overy harbour, bearing W.  $\frac{3}{4}$  S. ; and Holkham church, S.W. by S. The bottom is clay, and excellent for holding, vessels well found having ridden in it during strong gales.

**The COAST.**—The beautifully wooded domain of Holkham, formed from a bare sandy waste by the late Earl of Leicester, begins a short distance to the westward of Wells. The hall is not visible from the sea, but Holkham church (*see* view on chart, No. 1455), obelisk, and monument, are all very plain objects among the trees when close to the shore ; the former is the most prominent, as it stands upon an artificial mound. With the exception of Holkham Gap, sand-hills extend without interruption to Burnham Overy harbour, and the elevation of the back-land declines gradually towards the latter place.

**WELLS**,  $2\frac{1}{2}$  miles east of Holkham, and 6 miles to the westward

of Blakeney, stands low, being little above the level of the marshes ; the houses are mostly built of red brick and tiled, and the church with a plain square tower, and east and west windmills, the latter the highest, are its chief objects. The town is fronted by a substantial stone quay.

Wells has a custom-house with a district extending from Sandhole gap, between Sheringham and Weybourn, to Brancaster. The trade, including Burnham and Brancaster, consists of the export of grain and malt, and the importation of oilseed cake, coal, and general goods. The arrivals average 70 vessels a year. Population, 2,647 in 1881.

**A Life-Boat** is stationed at Wells.

**Wells Harbour** is formed by a salt-water creek. Entering a flat foreshore of shingle and sand it passes between two ridges of sand-hills, and then through the marshes up to the town, having an irregular course nearly three miles in length ; it then turns easterly, sending off several branches into the marshes. Many alterations have been made in the channel of late years ; dams have been placed across the mouths of the eastern creeks or fleets, to cause the whole force of flood and ebb to pass the quay at Wells, and a straight embankment has been carried from Wells to the western sand-hills for the reclamation of Holkham marshes. This harbour, like that at Blakeney, has been much injured by the embankment of marsh lands.

**Beacons.**—One mile below the town are extensive ridges of sand-hills, called Holkham and Wells meals, which divide the marshes from the sandy foreshore. Near the eastern extremity of Holkham meals, stands the High cape beacon, on which tidal and danger signals are hoisted ; and in front of the High cape beacon, upon the western side of the channel, is the Scalp beacon, a mast and large globe, visible at a distance of several miles.

The bed of the creek from the bar to the town is dry at low-water, except at the Pool, the general berthing place, where the depth is never less than 5 or 6 feet. The fairway of the entrance is marked by a *red* nun buoy, with staff and cage, in 24 feet ; and the channel to as far as abreast the black boat-house has *black* buoys to the westward, and *white* buoys to the eastward, but the number varies with the length of the channel, the direction of this portion of it being subject to change. Above the boat-house it is marked by small beacons. Westerly winds and a spring tide force the channel to the

eastward, and neap tides move it back again ; but the buoys are moved as changes occur. Vessels drawing 13 feet can get into the Pool on common springs, and those of 11 feet reach the town.

A steam-tug belongs to the port, and vessels are generally towed in and out.

**DIRECTIONS.**—In fine weather entry is easy. With the bar and channel in an average state, vessels can sail in with the wind from W.N.W., round northerly, to East. The east windmill at Wells well open to the westward of High cape beacon, or the latter well open to the westward of Scalp beacon, leads to the fairway and bar buoys ; proceed up the channel with the black buoys and Scalp beacon to the westward, and with the white buoys to the eastward, and then keep away to the south-eastward for the Pool, in which, and the channel generally, there is room for about twenty sail.

**CAUTION.**—Wells should never be attempted by night, nor even during the day by a stranger, except under extreme circumstances. North winds cause the highest sea upon the bar, and vessels embayed between Cromer and the flats, in north-east gales should anchor, rather than incur the risk of attempting the entrance. The same precaution as at Blakeney is also necessary, namely, to guard against the easterly going set, which runs strongly across the channel from half-flood to half-ebb.

Tide signals are hoisted by the pilots upon High cape beacon, but though they are familiar to the seamen frequenting the port, a description of them would be of little use to a stranger. A black ball or basket is hoisted at the beacon when it is supposed there is water enough over the bar for the vessel in the offing.

**TIDES.**—It is high-water, full and change, at Wells bar, at 6h. 20m. ; springs rise 18 feet, and 12 feet at the town ; high-water occurs 40 minutes later at the town than at the bar.

Off Wells, the flood stream runs to the eastward till 9 o'clock, or 3 hours after high-water on the shore.

**The COAST.**—From Wells to Blakeney the coast is low and sandy, with a sand-hill or “meal” occurring here and there, and is fronted by a shoal shelf. The background is well wooded, and the chief objects upon it are Morston and Stiffkey churches, and a few windmills. Care must be observed while standing to the westward in the vicinity of Wells, as the sand at low-water dries out from the coast for more than one mile.

**STIFFKEY, or STUKEY OVERFALLS**, is a ridge lying in front of and about  $1\frac{1}{2}$  mile from the entrance of Wells harbour; 8 feet is the least water upon it; within it there are 4 and 5 fathoms; and outside 4 to 7 fathoms.

**Cley and Blakeney** are not prominent from the sea, the former having much wood about it, and the situation of both being low. Blakeney church (*see* view on chart, No. 1455) is, however, a very conspicuous object from every part of the coast between Cromer and Hunstanton, and in clear weather it may be seen from the Dudgeon. It has a lofty tower, and a turret at the north-east angle of the chancel, supposed to have been used as a lighthouse in early times.

**BLAKENEY HARBOUR.**—The entrance to Blakeney harbour, 6 miles east of Wells, 12 miles to the westward of Cromer, and S. by W.  $\frac{1}{3}$  W., 16 miles from Dudgeon light-vessel, is well marked by the Hood, a sand-hill one mile to the eastward, remarkable as being higher than any of the sand-hills about it. The harbour is formed by the Ler, a salt-water inlet or creek, which runs in a south-westerly direction for half a mile, and then turns abruptly to the south-eastward. Abreast Blakeney it divides; one branch running to that place, and the other to Cley, where it takes the name of the Glaven.

The prosperity of Blakeney as well as of Cley has declined of late years, owing to the deterioration of the harbour which followed the enclosure of 12,000 acres of marsh lands. Seventy years ago, vessels drawing 9 feet could reach Cley; now, 5 feet is the greatest draught seen there, and the channel is, besides, too narrow to allow of a vessel swinging.

**A Life-Boat** is stationed at Blakeney.

Blakeney is a creek under the custom-house of Lynn. The common export is grain, and the imports are timber, salt, coals, manures, and general goods. Of the vessels belonging to the port, 12 are engaged in the neighbouring oyster fishery. Population, 817 in 1871.

A steam tug is employed here; the signal for her being a burgee at the main.

**Buoys.**—At the fairway of the entrance to the harbour is a *red* buoy, marked Blakeney Fairway, lying in 27 feet water, and the channel is marked for the first half-mile by *black* buoys to the

westward and *white* buoys to the eastward ;\* the two outermost buoys on each side carry beacons. The channel above the lower point is termed the Pit ; here vessels taking refuge, and those bound seaward, are commonly berthed. From the Pit to the town of Blakeney, the channel is marked by floating logs and small beacons.

A swathway to the westward of the principal entrance, named the West Low, is, when navigable, a useful passage to vessels of light draught in scant westerly winds, and it is then marked by a *chequered black* and *white* buoy in its fairway, and by two *red* buoys, which must be left on the starboard hand in entering, while two lozenge-shaped beacons upon the lower point lead through it. At the present time (1881) it is not open.

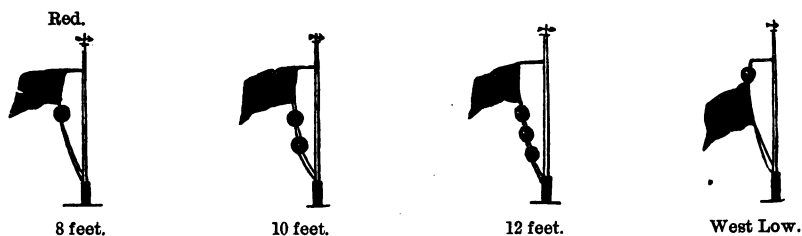
**Blakeney Bar** (a shifting one) is generally awash at low-water springs, and the direction and state of the channel are greatly affected by prevailing winds, those from N.E. and E.N.E. having an unfavourable effect, while westerly winds are beneficial, but the buoys are shifted upon any change occurring.

**Pilots and Signals.**—Pilots may always be obtained in moderate weather, but a vessel forced to run into Blakeney harbour without one must pay attention to the flags that, under such circumstances, are waved by the pilots on the lower point. When in safety, vessels may be berthed in any direction, as the bottom is soft.



Pilots' Look-out house  
and flagstaff.

The following signals, indicating the depth, are also hoisted on the watch-house flagstaff near the entrance. In making them, the pilots take into consideration the lift of sea at the time.



**CAUTION.**—When no signal is hoisted, the harbour should not be attempted, or, if one be shown for a moment and then hauled down, it is intended as a warning to that effect.

\* This arrangement as to colour is observed in the buoyage of most of the small harbours on this coast.

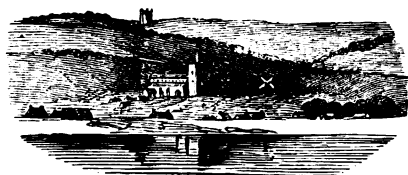
**DIRECTIONS.**—Blakeney church bearing S.S.E.  $\frac{1}{2}$  E. leads to the fairway buoy, and vessels of 14 and 15 feet draught can commonly enter the harbour during springs. In entering, keep close to the black buoys in westerly winds, and to the white buoys if the wind be easterly. It is necessary also to guard against the stream of flood, which, at the last-quarter, sets strongly to the eastward across the channel, but this ceases to be felt as the lower point is closed. The entrance can generally be sailed with the wind from N.N.W., round easterly, to S.S.E.

**TIDES.**—Between Blakeney and Cromer it is high water, full and change, by the shore, at 6h. 30m., and as far as Wells, the flood-stream runs to the south-eastward until 3 hours after high-water. Springs rise 15 feet at Blakeney bar, 9 feet at Blakeney, and  $5\frac{1}{2}$  feet at Cley; during neaps the rise is  $3\frac{1}{2}$  feet less at Blakeney and Cley. The stream runs 5 hours to the north-westward, and 7 hours to the south-eastward.

**BLAKENEY KNOCK and OVERFALLS** are the outermost of several shoal water ridges projecting from Burnham flats to the eastward in a direction parallel to the shore. They are abreast of, and three miles from, Blakeney harbour; they have 11 and 8 feet upon them, and 3 fathoms between them. The depths outside them are from 7 to 9 fathoms, and inside 5 to 9 fathoms.

**Buoy.**—A *black* bell buoy, with staff and globe, lies in  $6\frac{1}{2}$  fathoms at low-water, springs, three-quarters of a mile to the eastward of a depth of 3 fathoms upon their eastern end; with Kelling church, open eastward of Salthouse church, S. by E.; and Wells tower-mill, open eastward of a white house near the beach, S.W. by W.  $\frac{3}{4}$  W.

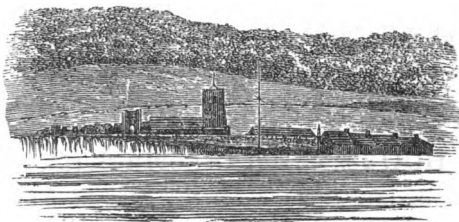
Blakeney church, bearing S. by W.  $\frac{1}{2}$  W., clears the east end of the Overfalls in 6 fathoms; Holkham monument and black boat-house in line, W. by S.  $\frac{1}{4}$  S., leads to the south-eastward in 5 fathoms; and Kelling and Salthouse churches in line, S. by E.  $\frac{1}{4}$  E., leads to the westward of the bell buoy in  $3\frac{1}{2}$  fathoms.



Kelling and Salthouse churches nearly in line, S. by E.  $\frac{1}{4}$  E.

**Coast.**—From Blakeney to Weybourn the coast is low and sandy, with shingle on the beach. Salthouse church, a rocket house on the beach in front of Salthouse; Weybourn coast-guard buildings and Weybourn mill to the east of the village, are all conspicuous objects.

**WEYBOURN.**—Weybourn church, with some ruins attached to it, is hidden by the cliff on most points of bearing, and the village does not appear whilst it is to the westward of S.W.



Weybourn church.

**Telegraph cables** extend from Weybourn to Emden, Heligoland, and Tønning.

**Rockets, &c.**, are kept at Weybourn, and Cley, for effecting communication with stranded vessels.

To the westward of Weybourn the back ground is high; Kelling church is upon the outline surrounded by wood, and the village of Salthouse, with its church and windmill, is seen below it to the northward. These two churches are used as a clearing mark for Blakeney Overfalls (*see* page 192).

**POLLARD SHOAL** lies abreast Salthouse; it is 2 miles long in a W.N.W. and E.S.E. direction, and three-quarters of a mile broad, with  $2\frac{1}{2}$  fathoms over it. The channel between it and the shore is one mile wide. Kelling and Salthouse churches in line, bearing S. by E., leads one mile to the westward of the Pollard.

**COAST.**—At Weybourn the coast begins to rise, and from thence to Cromer consists of cliffs for the most part of moderate height.

Neither of the villages of Upper or Lower Sheringham are very conspicuous from the sea, but Beeston hill and church, Runton church, and Cromer church and lighthouse, are all conspicuous; whilst at a distance from the coast, Sheringham mill, standing on the outline of the back land, is readily distinguished.

**LOWER SHERINGHAM**, a fishing village of red-tiled houses, is in a saddle or hollow, a little to the westward of a high bold cliff; there is generally a large number of boats lying on the



beach in front. The village of Upper Sheringham, with a mill on the outline, appears above it in the background.

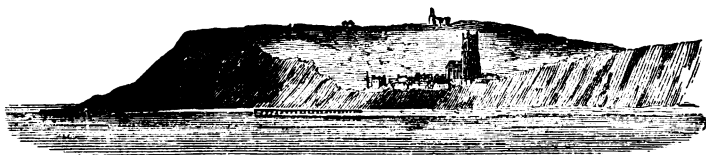
**A Life-Boat**, rockets, &c., are stationed at Sheringham.

**SHERINGHAM SHOAL**, in the offing abreast the village from which it takes its name, is 4 miles long in a N.W. by W. and S.E. by E. direction, and one-quarter of a mile broad, with  $2\frac{1}{2}$  to 3 fathoms upon it; it is steep-to, there being 10 fathoms within a short distance on both sides.

**BUOYS.**—**East Sheringham**, at the south-east end of the shoal, is a spherical buoy, *striped horizontally black and white*, with *staff and inverted triangle*, lying in 6 fathoms; with the east end of a grove of trees on the highland, in line with Runton mill, bearing S.  $\frac{1}{2}$  W.; and a mill on the back land, one quarter of the distance from Blakeney mill towards Blakeney church, W. by S.  $\frac{1}{2}$  S. A clear channel  $3\frac{1}{2}$  miles wide, with 6 to 10 fathoms depth over a bottom of shells, sand, and stones, separates this shoal from the Pollard.

**West Sheringham**, at the north-west end of the shoal, is a spherical buoy, *striped horizontally black and white*, with *staff and diamond*, in  $4\frac{1}{2}$  fathoms; with Blakeney church tower, three times its length westward of the bluff end of a wood, S.W.  $\frac{1}{2}$  W.; and Cromer lighthouse, S.S.E.  $\frac{1}{4}$  E.  $10\frac{2}{10}$  miles.

To pass outside Sheringham shoal, keep Cromer lighthouse bearing to the westward of south, until Blakeney church has been brought to the southward of W. by S.  $\frac{1}{2}$  S., when a course may be shaped for the Dudgeon.



Cromer church S.S.E.  $\frac{1}{4}$  E., 2 miles.

**CROMER**, frequently termed “Foulness,” from the rugged nature of the bottom in front of it, is a headland well known to seamen, being a common point of arrival and departure for vessels bound to the Wash, the Humber or to Flamborough head. Its mud cliffs (as they are termed) are high and bold, steep to the northward, and sloping gradually to the southward; they are formed of Boulder clay, gravel, and sand but are steadily being washed away for owing

to the action of land-springs and the sea, extensive landslips frequently occur. Westward of Cromer and extending to Weybourn is the geological formation known as the Norwich crag which contains most interesting fossils, amongst others the Mastodon (*M. arvernensis*).

**LIGHT.**—The prominent position of Cromer early pointed it out as an important light station. A coal fire, and subsequently a light, was displayed from a tower erected upon the cliff in 1719, the land in front of this lighthouse having been gradually washed away, another lighthouse was built in 1832 on a higher eminence in the rear. The old light-tower was a prominent object near the brink of the cliff until it was overthrown by the sea in December 1866.

The present light is *white* and *revolves every minute*, at an elevation of 274 feet above high-water, and may be seen in clear weather at the distance of 23 miles. From it, Foulness buoy bears N.E. by E.  $\frac{1}{4}$  E., distant  $1\frac{1}{2}$  miles, East Sheringham buoy, N.  $\frac{1}{2}$  W.,  $7\frac{1}{2}$  miles; Haisborough light-vessel, East,  $10\frac{3}{10}$  miles; Dudgeon light-vessel, N. by W.  $\frac{1}{2}$  W., nearly  $23\frac{1}{4}$  miles; and Flamborough head lighthouse, N. by W.  $\frac{1}{2}$  W., 87 miles.

**FOULNESS ROCKS.**—The bottom in front of Cromer lighthouse is an extension of a bed of chalk underlying the mud cliffs; it is very uneven, and causes a high sea in gales.

**Buoy.**—A *black* conical buoy, marked Foulness Rock, lies in  $6\frac{1}{2}$  fathoms at the outer extremity of the foul ground; with Cromer lighthouse bearing S.W. by W.  $\frac{1}{4}$  W., distant  $1\frac{1}{2}$  mile; Happisburgh lighthouse, its full length westward of Happisburgh church, S.S.E. easterly. At night, go no nearer to it than into a depth of 8 or 9 fathoms.

In rounding Cromer in thick or foggy weather, when bound to the southward, by keeping in a depth of from 9 to 11 fathoms, when past the Sheringham shoal, a vessel will ensure being inside the Haisborough sand.

**Cromer** town is on the brink of a cliff 30 or 40 feet high, three-quarters of a mile to the north-westward of the lighthouse; the cliff rises steeply on either side, and the country behind is bold and well wooded. This place, anciently called Shipden, was of considerable extent and importance, but half of the town including one of its churches, has been swept away by the sea. The remaining church which has an embattled tower 160 feet high, is the principal object seen from the sea. That part of the town which faces the sea consists

of respectable lodging and dwelling-houses, the bank on which they stand being protected from inroads of the sea by extensive barriers and groynes, and an esplanade faced by a stone wall. There is also a pile jetty on the sands in front for the accommodation of visitors. The railway connects Cromer with Norwich, &c. Population, 1,423 in 1871.

Cromer possesses no harbour, and colliers discharge their cargoes on the beach.

**A Life-Boat**, and apparatus for saving life, are maintained here.

**TIDES.**—It is high-water, full and change, at Cromer, at 7h.; springs rise  $14\frac{1}{2}$  feet, neaps rise 11 feet, and range  $7\frac{1}{2}$  feet. Four miles off Cromer, the flood stream runs to the S.S.E. until 10h. 15m., or 1h. before high-water at Dover, and the ebb in an opposite direction.

#### SHOALS IN THE OFFING.

The shoals lying in the eastern approach to Lynn Deep, and in the offing abreast the coast of Norfolk, and to the eastward of the Docking, will now be described.

**DUDGEON** is a very dangerous bank lying nearly in the direct track of the eastern coast trade between Flamborough head and Cromer. It is  $2\frac{1}{2}$  miles long in a N.N.W.  $\frac{1}{2}$  W. and S.S.E.  $\frac{1}{2}$  E. direction, and one mile broad; the depths upon it vary from 13 feet to 5 fathoms, and it has 6 to 10 fathoms about it.

**DUDGEON LIGHT-VESSEL.**—The Dudgeon is marked by a light-vessel moored in 10 fathoms, in lat.  $53^{\circ} 14' 36''$ , N., long.  $0^{\circ} 57' 15''$ , E., three-quarters of a mile from the five fathoms edge of the shoal; the light, which is shown at 35 feet above the water, is *double flashing, one white flash and one red flash* following each other in quick succession *every half minute*. The red flash is as nearly as possible equal in power with the white flash, and the proportions of time are—white flash *two and half seconds*, darkness *two and half seconds*, red flash *two and half seconds*, darkness *twenty-two and half seconds*.

The light is visible in clear weather 10 miles. The ball at the mast-head is 70 feet above the water line.

**Fog Signal.**—A gong is sounded in thick or foggy weather.

In very clear weather the land can be distinguished from the Dudgeon light-vessel, but as it is to the southward, and consequently for the

most part of the day under the sun, the objects on shore are not readily made out; the most conspicuous objects are Cromer lighthouse, Sheringham mill, and Blakeney church tower; all on the skyline. Brancaster mill and Holkham church may, under very favourable circumstances, also be seen, but it must be in the height of summer and close to sunset and sunrise, so that the sun shines on them.

From the Dudgeon light-vessel, Cromer lighthouse bears S. by E.  $\frac{1}{2}$  E., distant  $23\frac{1}{4}$  miles; Spurn high lighthouse, N.W.  $\frac{1}{2}$  N., 36 miles; Flamborough head lighthouse, N. by W.  $\frac{1}{2}$  W., 63 miles; Haisborough light-vessel, S.E.  $\frac{1}{2}$  S., 28 miles; East Sheringham buoy, S.S.E.,  $16\frac{1}{8}$  miles; South Race buoy, S.S.W.  $\frac{1}{4}$  W., nearly 6 miles; North Race buoy, W. by N.  $\frac{1}{2}$  N., 7 miles; Inner Dowsing light-vessel, N.W. by W.,  $14\frac{1}{2}$  miles; Outer Dowsing light-vessel, N.E.  $\frac{3}{4}$  N.,  $13\frac{1}{4}$  miles; and East Dudgeon buoy, N.E.  $\frac{3}{4}$  N.,  $3\frac{9}{10}$  miles.

**Buoy.**—A can buoy, *striped black and white vertically*, lies in 5 fathoms, upon the south-west side of the shoalest part of the Dudgeon, with the light-vessel bearing W. by S., distant 8 cables.

**North Ridges**, though separated from the Dudgeon by a narrow 5-fathoms channel, may be considered as a north-west continuation of that shoal; they consist of several parallel ridges lying in a north-west and south-east direction with 3 fathoms upon them, and having deeper water between them; their north-west extremity is N.N.W.  $\frac{1}{2}$  W., 5 miles from Dudgeon light-vessel. The overfall on these ridges is very conspicuous at low water, as owing to the fact that the turn of the stream nowhere coincides with the local time of high and low water there is a strong stream running at low water running across the ridges. Three miles north-westward of the North Ridges are several other patches with  $3\frac{1}{2}$  to 5 fathoms over them. All these obstructions are much in the way of vessels of heavy draught.

The light-vessel kept to the eastward of S.E. by S. will clear the North Ridges, but about low-water it is a safer course to pass to the eastward of the Dudgeon, giving the light-vessel a berth of 3 or 4 miles.

**Emerson Knoll** is a small patch of 4 fathoms, 4 cables long and one cable wide, north-east of the Dudgeon, the centre of which is in lat.  $53^{\circ} 18' 15''$  N., long.  $0^{\circ} 59' 10''$  E. It is marked on its eastern side by a *black* conical buoy with staff and globe, named East Dudgeon buoy. From the buoy Dudgeon light-vessel bears S.W.  $\frac{3}{4}$  S.,  $3\frac{9}{10}$  miles; Outer Dowsing light-vessel N.E.  $\frac{3}{4}$  N.,  $9\frac{4}{10}$  miles.

**RACE BANK**, to the south-westward of, and abreast, the Dudgeon, is separated from it by a channel 4 miles wide. From the south end, the direction of the shoal is first N.  $\frac{3}{4}$  W., for 3 miles, and then N.W.  $\frac{3}{4}$  N., for  $4\frac{1}{2}$  miles. It is very narrow, and the shoalest spot (9 feet) is  $1\frac{3}{4}$  mile from the south tail, but 2 and 3 fathoms are the general depths upon it. There is depth of 7 fathoms close to the eastward, 10 fathoms to the westward, and 8 and 10 fathoms between it and the Dudgeon.

**BUOYS.**—Race bank is marked by a buoy at each extremity.

**North Race** buoy is spherical *striped red* and *white horizontally*, with *staff and diamond*, in 8 fathoms, with Dudgeon light-vessel, bearing E. by S.  $\frac{1}{2}$  S., distant 7 miles; and Inner Dowsing light-vessel, N.W.  $\frac{3}{4}$  N., 8 miles.

**South Race** buoy is spherical, *striped red* and *white horizontally*, with *staff and inverted triangle*, in 5 fathoms; with a gap in the trees on the high back land, open south of Brancaster mill, S.W. by W.  $\frac{1}{4}$  W.; Cromer lighthouse, S.S.E.  $\frac{3}{4}$  E.,  $19\frac{1}{2}$  miles.

There are two small ridges with 3 and 4 fathoms upon them, one mile to the eastward of the north-west end of Race bank.

**HADDOCK BANK** to the southward and eastward of the Outer Dowsing shoal, is upwards of 15 miles in length, in a general N. by W. and S. by E. direction by 3 miles in breadth. The general depths are from 6 to 10 fathoms, but there is a small knoll of only 3 fathoms in lat.  $53^{\circ} 17' N.$ , long.  $1^{\circ} 33' E.$ , on a bank of less than 5 fathoms, which bank is  $2\frac{1}{4}$  miles in length and half a mile in breadth. From the 3 fathoms knoll Cromer lighthouse bears S.W.  $\frac{1}{2}$  S.,  $23\frac{1}{4}$  miles; the Dudgeon light-vessel W. by N.,  $21\frac{1}{2}$  miles; South Dowsing buoy N.W.  $\frac{1}{2}$  W.,  $13\frac{1}{2}$  miles; North-west Leman buoy S.E.  $\frac{3}{4}$  S.;  $13\frac{3}{4}$  miles. Haisborough light-vessel S. by W.  $\frac{1}{4}$  W.,  $18\frac{1}{2}$  miles.

**INNER CROMER KNOLL** to the south-westward of the Haddock bank, is a small patch of from 6 to 8 fathoms, 2 miles long and one mile broad, from the centre of which Cromer lighthouse bears S.W. by S.,  $18\frac{1}{4}$  miles.

**OUTER DOWSING** the last shoal to be described in this section, is within a depth of 10 fathoms, 22 miles long S. by E.  $\frac{1}{2}$  E. and N. by W.  $\frac{1}{2}$  W., and upwards of 4 miles wide at its broadest part. Its northern extremity is in lat.  $53^{\circ} 33\frac{1}{2}' N.$ , long.  $1^{\circ} 0' E.$ , and its southern extreme in lat.  $53^{\circ} 15\frac{1}{2}' N.$ , long.  $1^{\circ} 20' E.$  At the northern

end of the Outer Dowsing there is a narrow sand ridge, 7 miles long and a quarter of a mile wide, the least depth on which is  $2\frac{1}{2}$  fathoms. One and three-quarter miles south of this sandy ridge there is another patch 2 miles in length by three-quarters of a mile in breadth, the least water on which is 3 fathoms. At the southern end of the shoal are some sandy knolls of  $4\frac{1}{2}$  to 5 fathoms, the central one being named Cromer knoll. Between the shoal parts the depths are from 6 to 9 fathoms. The Outer Dowsing is marked by a light-vessel and two large buoys.

**OUTER DOWSING LIGHT-VESSEL** is moored on the west side of the shoal in  $9\frac{1}{2}$  fathoms at low-water, in lat.  $53^{\circ} 27' N.$ , long.  $1^{\circ} 5' 0'' E.$ ; the light *revolves* showing a *red face every thirty seconds*, at 36 feet above the sea and is visible at the distance of 11 miles in clear weather. In order to render this vessel more readily distinguishable in the day from the other light-vessels in the vicinity, she carries a half-globe above the usual globe. The top of the half-globe is 77 feet above the water line.

**Fog Signal.**—In thick or foggy weather, a siren gives *two* blasts in quick succession *every two minutes*. The first blast a *low note*, the second a *high note*.

From the light-vessel, the North Outer Dowsing buoy bears N. by W., distant  $4\frac{9}{10}$  miles; Spurn high lighthouse, N.W. by W.  $\frac{1}{2}$  W.,  $35\frac{4}{10}$  miles; Dudgeon light-vessel, S.W.  $\frac{3}{4}$  S.,  $13\frac{1}{4}$  miles; Cromer lighthouse, South (westerly)  $32\frac{1}{2}$  miles; South Outer Dowsing buoy, S.S.E. (easterly)  $6\frac{1}{2}$  miles; the Watch buoy of the light-vessel E. by S.  $\frac{3}{4}$  S., three-quarters of a mile; north extreme of the shoal (5 fathoms) N.  $\frac{3}{4}$  W.,  $5\frac{1}{2}$  miles; and the nearest shoal spot, E. by N., 9 cables.

**North Outer Dowsing Buoy.**—A large *spherical* buoy *striped horizontally black and white*, carrying a *staff and diamond*, and marked Outer Dowsing North end, lies towards the north end of the shoal, in 6 fathoms water, about 2 cables westward of a patch of 4 fathoms, and N. by W.,  $4\frac{9}{10}$  miles from the light-vessel.

**South Outer Dowsing.**—A large *spherical* buoy, *black and white horizontal stripes with staff and inverted triangle*, lies in  $6\frac{1}{2}$  fathoms at the south end of the shoal part of the Outer Dowsing. From it the light-vessel bears N.N.W. (westerly)  $6\frac{1}{2}$  miles, East Dudgeon buoy, W. by S.,  $8\frac{1}{2}$  miles.

A *chequered black and white can watch buoy*, marked Outer Dowsing Watch, is E. by S.  $\frac{3}{4}$  S., three-quarters of a mile from the vessel.

**OUTER DOWSING CHANNEL**, between the Dudgeon and Outer Dowsing shoals, is 8 miles wide at its narrowest part. At its northern half the depths are for the most part shallow, being under 10 fathoms, the exception to this being a narrow ditch upwards of 4 miles in length, immediately west of the Outer Dowsing light-vessel, in which the depths are from 20 to 25 fathoms. This deep water ditch is of nearly the same size and shape as the sandy ridge which forms the summit of the shoal. In the middle of the Outer Dowsing channel is a 5 fathom sandy knoll, over which the tide ripple is distinctly visible at low water. From this knoll, which is in lat.  $53^{\circ}21'50''$  N., long.  $1^{\circ}2'30''$  E., the outer Dowsing light-vessel bears N.E. by N.  $5\frac{4}{10}$  miles, the Outer Dowsing South buoy E. by S.  $\frac{1}{4}$  S.  $5\frac{8}{10}$  miles; East Dudgeon buoy S.W. 4 miles; and Dudgeon light-vessel S.W.  $\frac{1}{2}$  S. nearly 8 miles. North-west and south-east of the knoll the depths are from 6 to 8 fathoms, but half a mile north-east or south-west of it the depth increases to 11 and 13 fathoms. In the southern half of the Outer Dowsing channel the depths are 10 to 12 fathoms at low water, with holes of from 16 to 18 fathoms here and there. The bottom throughout is of sand, stones, and shells.

**SILVER PIT**.—Between the Outer Dowsing shoal and the entrance to the river Humber is a deep depression, known as the Silver Pit, in one part of which the soundings are 50 fathoms. Taking the 20 fathom contour line as the outer margin of the Silver Pit, the south end is in lat.  $53^{\circ}23'$  N., long.  $0^{\circ}42'$  E., and its northern end is lat.  $53^{\circ}44'$  N.; long.  $0^{\circ}47'$  E., its length being about 22 miles, and its average breadth  $1\frac{1}{2}$  miles. The edge of the deep water is usually marked by tide ripples. The utility of this ditch in thick weather is obvious.

**Tidal Streams**.—In the Outer Dowsing channel and on the Outer Dowsing shoal the flood stream runs S.S.E., and the ebb N.N.W., the latter part of the flood turning to the eastward and north-eastward, and the latter part of the ebb to the westward and south-westward. Nearer the Dudgeon the stream is yet more rotatory in character, and is never slack. This rotatory stream occupies the space between the Dudgeon and the Inner Dowsing, when it again becomes more settled, and runs fairly up and down the coast.

The change in the direction of the stream is nowhere coincident

with the local times of high and low water. At the north end of the Outer Dowsing shoal and channel the south going or flood stream runs until 9 h., at the Outer Dowsing light-vessel until 9 h. 15 m., at the South Outer Dowsing buoy until 9 h. 30 m., and at the tail of the shoal until 9 h. 45 m. Whilst close in shore from Flamborough head to the Wash the south going stream ceases at 7 h., and the north going at 1 h., or at about half an hour before high water at Hull.

The following tables give the rate and direction of the tidal streams at each hour at the Dudgeon and Outer Dowsing light-vessels.

#### AT THE DUDGEON LIGHT-VESSEL.

##### With tide rising at Hull.

At low water stream sets	...	...	N. by W. 2 kn.
1 hour after low water	...	...	N.W. by N. $1\frac{1}{2}$ kn.
2     "     "     "	...	...	N.W. by W. 1 kn.
3     "     "     "	...	...	W. by N. $1\frac{1}{4}$ kn.
4     "     "     "	...	...	S.W. 2 kn.
5     "     "     "	...	...	S. by E. 2 kn.

##### With tide falling at Hull.

At high water stream sets	...	...	S.E. by S. 2 kn.
1 hour after high water	...	...	S.E. by E. $1\frac{3}{4}$ kn.
2     "     "     "	...	...	E. by S. $1\frac{1}{2}$ kn.
3     "     "     "	...	...	E. by N. $1\frac{1}{4}$ kn.
4     "     "     "	...	...	N.E. $1\frac{1}{4}$ kn.
5     "     "     "	...	...	N. by E. 2 kn.

#### AT THE OUTER DOWSING LIGHT-VESSEL.

##### With tide rising at Hull.

At low water stream sets	...	...	North 2 kn.
1 hour after low water	...	...	N. by W. 2 kn.
2     "     "     "	...	...	N.N.W. 1·5 kn.
3     "     "     "	...	...	N.W. by W. 0·5 kn.
4     "     "     "	...	...	S.W. 0·5 kn.
5     "     "     "	...	...	S.S.W. 1·5 kn.

##### With tide falling at Hull.

At high water stream sets	...	...	South 2 kn.
1 hour after high water	...	...	South 2 kn.
2     "     "     "	...	...	S.S.E. 1·5 kn.
3     "     "     "	...	...	S.E. 0·5 kn.
4     "     "     "	...	...	N.E. 0·5 kn.
5     "     "     "	...	...	North 1·5 kn.

By referring to a similar table given at page 162, for the Inner



Dowsing light-vessel, it will be seen that the change of stream is much earlier there than to the eastward. Vessels, therefore, meeting the first of the flood stream off Cromer will gain by steering for the Inner Dowsing light-vessel, passing either north or south of the Race Bank.

**DIRECTIONS.**—Vessels bound to Lynn Deep, after passing Cromer, may, if of light draught, and with a suitable condition of tide, proceed along the coast inside of the Pollard shoal, and by the Bridgirdle, and Gore Middle buoys, through the Bays ; but it must be remembered that at half flood tide, by the shore, the stream begins to set to the south-eastward, and consequently makes against a vessel bound to the westward. If the weather is moderately clear, the route between the Sheringham shoal and Blakeney Overfalls may be taken, and then between the Docking shoal and Burnham flats. Vessels of heavy draught should, however, go north of the Docking shoal. Bound to the Humber, vessels may go either north or south of the Sheringham and Race banks or even outside the Dudgeon. Much will depend on the state of the tide and the weather, remembering that the Dudgeon light-vessel is a good object to make, and from her a short run takes a ship to the Inner Dowsing light-vessel. If bound to Flamborough head, vessels may either proceed through the Outer Dowsing channel or close by the Dudgeon and Inner Dowsing. The latter route, though slightly longer, will be more profitable under certain circumstances ; for instance, if when off Cromer the south-going stream is running, it is well to remember that it changes and runs north at the Inner Dowsing light-vessel two hours before it does so at the Outer Dowsing. Bound south from Flamborough head to Cromer, the Outer Dowsing channel is decidedly the best, for by using it vessels always have more tidal stream with than against them. From the Humber towards Cromer it will be usually found more advantageous to proceed by the Inner Dowsing light-vessel, and then north or south of the Race Bank, according to the state of the weather and tide.

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## CHAPTER VI.

## CROMER TO ORFORDNESS.

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VARIAION 16° 25' to 16° 55' West in 1889.

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In this chapter, which treats of the coast and off-lying dangers between Cromer and Orfordness, as also of the important channels through Yarmouth roads and outside, through the Haisborough gat and Would, the coast from Cromer to Winterton with the off-lying sands, between which and the coast are the channels known as the Would and Haisborough gat, are first described ; then the outer dangers, viz., the Leman and Ower banks, and Smith's knoll ; afterwards Yarmouth and Lowestoft roads, and finally the coast to Orfordness. To avoid a break in the continuity of the description and directions for the navigation, the *positions* of the numerous buoys marking the dangers in this difficult part of the East coast pilotage are given at the end of the chapter ; the numbers and description of the buoys only being mentioned in the text.

Throughout the whole space the uniform system of buoyage is adopted, a description of which is given on pages 12 and 13.

**The COAST** from Cromer to the south-eastward continues high for one mile, with indications of extensive land slips ; in fact, the whole of the mud cliffs (as they are termed), from Cromer to Happisburgh, being formed of diluvial matter, principally clay with masses of chalk imbedded in it, are subject to incessant inroads of the sea. The church and pretty village of Overstrand, one mile to the southward of Cromer lighthouse, stand back from a lower part of the cliff, and behind are well-wooded hill and dale ; a black windmill is prominent to the south-eastward of the village. The cliff again rises towards Sidestrand ; the old church tower is on the brink of the cliff, the new church, which is not so conspicuous, is farther back ; the old church tower looks white when seen from the south-eastward, and is sometimes mistaken for Cromer lighthouse. The village of

Trimingham also stands back a little from the cliff, having near its centre a small church with a stunted tower. Just south-east of Trimingham is Beacon hill house, a small building on the top of the highest hill over the cliff, which is a conspicuous object from seaward.

Rockets and lines are kept at Sidestrand in case of wreck.

**MUNDESLEY.**—The cliff, generally of uniform height from Sidestrand to Trimingham, gradually declines towards Mundesley, which is seated in a score or break in it ; here, several large barriers or breakwaters have been built to resist the encroachment of the sea. The village is small and well built, and has a coast-guard station. The church (a portion of which is in ruin) stands to the northward of the village, near the brink of the cliff ; it is a small building without a tower, and looks like a barn with a peaked roof from the sea.

**Life-Boats.**—A life-boat, rockets, &c., are maintained at Mundesley.

Beyond Mundesley, the cliff, continuing high for more than one mile, then descends to Bacton, and to Happisburgh : the average height is not more than 20 feet. Several churches with square towers show behind the coast line ; the most conspicuous is Bacton. Stow hill mill is also conspicuous, but when close in shore it is sometimes hidden by the higher slope in front of it.

**HAPPISBURGH**, or Haisborough, as it is variously termed, stands upon a rounded hillock a short distance back from the cliff, and but few of the houses are seen from the sea. The church adjoining the north-west side of the village, a lofty structure, with an embattled tower 150 feet high, is one of the most prominent objects on the coast. Owing to the cliff in front having an under-stratum of sand and gravel, the sea has made rapid advances upon it, and a breadth of 170 yards of coast has been lost in 60 years.\* Should the same destructive action continue, both church and village will have been swept into the sea by the middle of the ensuing century.

**Life-Boat.**—Happisburgh is a life-boat and rocket station.

**LIGHT.**—Two lighthouses were erected at Happisburgh in 1791 to lead through Haisborough gateway, but the lower one was removed in 1886. The lighthouse still standing exhibits, at an elevation of 136 feet above high water, an *occulting white light*, visible in clear weather 17 miles. The light disappears for *five seconds every half-*

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\* This was written in 1858.

*minute*, that is, the light is *visible* 25 *seconds*, then eclipsed for *five seconds*.

The whole of the coast from Cromer to Happisburgh is fronted by a submarine forest, and in the cliffs and on the shore are found plants and seeds of Scotch and spruce firs, yew, elder, oak and birch; and remains of elephants, rhinocerus, hippopotamus, beavers, wolves, narwhals and whales.

The whole of the shore from Cromer to Happisburgh is fairly clear, and may be approached with the lead, except abreast Trimingham, where a patch of  $4\frac{1}{2}$  fathoms extend  $1\frac{1}{4}$  mile off, and another patch with 5 fathoms upon it lies about E. by S.  $\frac{3}{4}$  S.  $1\frac{1}{2}$  mile from Happisburgh church, for which reason the shore thereabouts should not be approached nearer than a depth of 9 fathoms.

The change from cliff to sand-hills occurs about a mile to the southward of Happisburgh lighthouse. The sand-hills are from 30 to 40 feet high at Palling, and lower from thence to Winterton-ness. The chief objects which present themselves are, the ruined octagonal tower of Eccles church, the base of which is washed by the sea at high water; Palling church and look out; Waxham church (a thick tower); Ingham church tower (high and conspicuous); and the Thwart coast-guard, a small white building with a flag-staff on the top of a sandhill.

**Two Life-Boats** and rocket apparatus are stationed at Palling.

The shore from Happisburgh to Winterton-ness is clear, and may be approached by the lead.

**WINTERTON-NESS** is distinguished by a high sand-hill, upon which is a red-tiled house and a flagstaff. The village of Winterton is behind the sand-hills, but the lofty tower of its church is a fine sea-mark, visible many miles seaward, and forms an excellent guide to the north entrance to Yarmouth roads. At the back of this church Somerton and Martham churches may also be distinguished.

**WINTERTON LIGHTHOUSE**, erected in 1790, stands on an eminence one quarter of a mile to the southward of Winterton, and a little back from the shore. The tower, 69 feet high, is painted red, and exhibits at 110 feet above high water a *fixed white* light, which may be seen in clear weather at the distance of 16 miles. It is obscured on a N. by W.  $\frac{1}{4}$  W. bearing or southward of a line from it to the West Scroby buoy.

**Life-Boats.**—Two life-boats, and the usual apparatus for effecting communication with stranded vessels, are stationed at Winterton.

**Buoy.**—Winterton-ness is fronted by a shoal shelf extending half a mile out, with 3 fathoms upon it. It is marked on the outside by a *red* conical buoy, in 5 fathoms; with Winterton church, on with the south end of a grove of trees, bearing S.W.  $\frac{1}{4}$  S., Winterton lighthouse, just to the southward of a red-tiled building S.S.W.  $\frac{1}{2}$  W. and Thwart coast-guard W. by N.  $\frac{1}{4}$  N. A berth of one mile from the shore, or a depth of 10 fathoms, will clear it.

Several dangerous shoals lying off the coast between Cromer and Winterton will now be described.

**The WOULD**, a channel 14 miles long and 7 miles wide, begins abreast Cromer, and is continued between Haisborough sand and the coast of Norfolk, with the outlets, Haisborough gateway to the south-eastward, and Cockle gateway to the southward.

**HAISBOROUGH SAND**, the eastern boundary of the channel named the Would, is (within the contour line of 10 fathoms) 12 miles long in a N.N.W.  $\frac{1}{2}$  W. and S.S.E.  $\frac{1}{2}$  E. direction by a little over a mile in width. From its north end Cromer lighthouse bears West, distant  $11\frac{1}{2}$  miles; and the south-east end of the Leman, E. by S.,  $20\frac{1}{2}$  miles. There is a clear passage about 6 miles wide between it and the main. The shoal is steep-to, there being 15 and 16 fathoms within half a mile on both sides, and it nearly dries in several places at low-water. It is usually marked by breakers, but occasionally, though rarely, the sea is so smooth that there is not even a ripple over it. A tail, having as little as 12 feet on it, projects from its south end upwards of 4 miles North, and nearly connects it with the north end of Hammond knoll.

The Haisborough sand is marked by a *spherical* buoy at the north end, four *can* buoys on the west side, a *can* buoy with *staff* and *cage* at its south end, and a large *conical* buoy with *staff* and *globe* on the east side. In addition two light-vessels the North Haisborough and the Would mark its western boundary and the eastern side of the Would channel.\*

**North Haisborough Light-Vessel.**—A light-vessel carrying two *fixed white* lights at equal heights on separate masts, each light

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\* For positions of these buoys, *see* the end of this Chapter, page 248.

being 35 feet above the sea, and visible at the distance of 10 miles in clear weather, is moored one mile to the westward of the north end of Haisborough sand, in 14 fathoms; the vessel carries a ball at each mast-head, and has N. Haisboro' painted on her side.

The vessel lies with Trunch church well open north of Mundesley church S.W. by W.  $\frac{1}{2}$  W.; Cromer lighthouse, West,  $10\frac{1}{2}$  miles; Dudgeon light-vessel, N.W.  $\frac{1}{2}$  N., 28 miles; Outer Dowsing light-vessel, N. by W.  $\frac{1}{2}$  W., 34 miles; Would light-vessel, S.S.E.,  $11\frac{1}{2}$  miles; and North Haisborough buoy E.  $\frac{3}{4}$  S.,  $1\frac{1}{4}$  miles.

**Fog Signal.**—In thick or foggy weather a gong is sounded.

**WOULD LIGHT-VESSEL** is moored off the south end of Haisborough sand, in 15 fathoms, with Winterton church S.W. westerly 8 miles; Happisburgh church W. by N.  $\frac{1}{3}$  N.,  $9\frac{1}{2}$  miles; Newarp light-vessel, S. by E.  $\frac{1}{2}$  E.,  $5\frac{1}{2}$  miles; North Haisborough light-vessel, N.N.W.,  $11\frac{1}{2}$  miles. She exhibits a *quick revolving white* light, showing a *flash every five seconds*, at 38 feet above the sea; and visible at the distance of 11 miles in clear weather.

The attention of mariners is particularly directed to the difference in character between the Would light and that of the Newarp and the Leman and Ower light-vessels. The Would is, as described above, a *quick-revolving* light, showing a *flash every five seconds*; but the Newarp and Leman and Ower are *group flashing* lights, the Newarp showing *three flashes* in quick succession, followed by an interval of *thirty-six seconds* of darkness (the whole revolution occupying *one minute*); and the Leman and Ower giving *two quick flashes*, followed by *twenty seconds* of darkness, and repeated *every half minute*.

The Would light-vessel has one mast with a diamond, the top of which is 76 feet above the water line.

**Fog Signal.**—In thick or foggy weather a gong is sounded.

**TIDAL STREAMS.**—At Haisborough light-vessel, the general direction of the flood and ebb streams is S.S.E and N.N.W., and their rate during springs is 3 knots per hour, the south-going stream running whilst the tide is rising at Dover, and the north-going when the tide is falling there, the turn of the streams being about three-quarters of an hour before high and low-water at Dover.

**WINTERTON SHOAL**, which is irregular in form, lies at the southern end of the Would between Winterton ness and the Newarp; it is about  $2\frac{1}{2}$  miles long in a north-west and south-east direction and

one mile broad, with from  $5\frac{1}{2}$  to 10 fathoms water over it; the shoalest portion being N.E. by E.  $\frac{1}{2}$  E., 4 miles from Winterton light-house.

**HAMMOND KNOLL**, parallel to and only  $1\frac{1}{2}$  mile outside the south-east extremity of Haisborough sand, is 7 miles in length in a N. by W.  $\frac{3}{4}$  W. and S. by E.  $\frac{3}{4}$  E. direction, and half a mile broad. The least depth (10 feet) is near the south end; and there are depths of from 14 to 16 fathoms close-to on either side.

**Buoys.**—Hammond knoll is marked by two buoys, one *conical black* just eastward of the northern 5-fathom patch on the shoal, and the other a *can* buoy painted in *black and white vertical stripes* at the southern end of the shoal. The two buoys bear from each other N. by W.  $\frac{1}{4}$  W. and S. by E.  $\frac{1}{4}$  E., the distance between them being  $4\frac{1}{4}$  miles.\*

**WINTERTON RIDGE**, upon which H.M.S. *Invincible* was lost in 1807, is to the south-eastward and nearly a continuation of Hammond knoll, a channel only one mile wide intervening. This shoal is 8 miles long, in a N. by W. and S. by E. direction, from 10 fathoms upon each end, and three-quarters of a mile broad. The least water upon it is  $2\frac{1}{4}$  fathoms; there are 15 and 16 fathoms on each side, and from 12 to 17 fathoms between it and Hammond knoll.

**Buoys.**—The Winterton ridge is also marked by two buoys, one *conical black*, with *staff and globe and half globe* on the eastern side of the north end of the shoalest water, in 12 fathoms; and the other a *spherical* buoy, *striped horizontally black and white* with *staff and St. George's cross* at the south end of the shoal, in  $4\frac{1}{2}$  fathoms. The two buoys bear from each other N.  $\frac{1}{4}$  W. and S.  $\frac{1}{4}$  E., the distance between them being 3 miles.\*

**HAISBOROUGH GATWAY**, the south-eastern outlet from the Would, is between the three shoals, Haisborough sand, Hammond knoll, and Winterton ridge to the north-eastward, and Winterton shoal and the Newarp to the south-westward; it is a clear passage 4 miles wide, with from 11 to 20 fathoms depth in it.

**TIDES AND TIDAL STREAMS.**—The tidal wave is much retarded between Cromer and Winterton, taking an hour and twenty-

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\* For position of buoys, see the end of this Chapter, page 249.

five minutes to travel along the coast between the two points, a distance of 25 miles, and the rise and fall gradually decreases as the wave advances, from  $14\frac{3}{4}$  feet at Cromer to  $7\frac{3}{4}$  feet at Winterton ness. The high-water at full and change at Cromer is 7h., at Happisburgh 7h. 40m., and at Winterton ness 8h. 25m. In the offing the rate of the tidal wave is not so much retarded, for it is high-water at full and change at the north end of the Haisborough sand at 7h. 10m., and at the south end of the Winterton ridge at 8h., thus taking 50 minutes to travel 20 miles. Neither is the difference in the rise and fall so great as in-shore, as it is 14 feet at the north end of the Haisborough sand, and 9 feet at the Winterton ridge.

The tidal stream does not depend on the local times of high and low-water anywhere between Cromer and Winterton, or in the Would and Haisborough gat, but will be found to be running to the southward when the tide is rising at Dover, and to the northward when the tide is falling there, the slack stream occurring close to the time of high and low-water at Dover ; almost precisely so in the Haisborough gateway, but from half an hour to an hour before the time of high and low-water at Dover and at Cromer, and in the offing abreast. The direction of the stream is fairly parallel to the channels, but it has a tendency to rotate, the last of the ebb, or north-going stream, turning to the N.E. and eastward ; and the last of the flood, or south-going stream, to the S.W. and westward ; the greatest strength at springs is from  $2\frac{1}{2}$  to 3 knots. This peculiarity of the set of the tidal stream, with reference to the local times of high and low-water, has the effect that the stream is at its full strength at high and low-water by the shore and over the sands, and that at slack-water it is nearly always half tide ; consequently at low-water the stream, especially with northerly winds, ripples or breaks over almost every inequality of the bottom ; with strong northerly winds, during the strength of the ebb, there are not only heavy breakers over the whole of the Haisborough sand, the Hammond knoll, and Winterton ridge, but also on the Winterton overfalls, the least depth on which is 33 feet, and on the Newarp the least depth on which is 36 feet. The rotatory action of the stream here is in exactly the contrary direction to that which obtains at the Dudgeon and Outer Dowsing ; there it turns against the hands of a clock, here with the hands of a clock.

**DIRECTIONS for the Would and Haisborough Gateway.**

—In navigating the Would there is little difficulty if the lead be properly attended to ; there is foul ground for  $1\frac{1}{2}$  mile off Cromer, at



the same distance off Trimingham are patches of  $4\frac{1}{2}$  and 5 fathoms, and Winterton ness is fronted by a shelf with 3 fathoms upon it extending out half a mile; with these exceptions the shore is fairly clear, and may be approached at discretion. In the middle of the Would the depths increase to upwards of 20 fathoms, and a vessel standing towards Haisborough sand should tack on the first shoal cast, as there are 15 and 16 fathoms within half a mile of it.

There are two outlets from the Would to the southward and south-eastward, namely, by Cockle gateway,\* through Yarmouth roads; and by Haisborough gateway, and so round by the back or outside of Yarmouth sands. The latter is considered the safer passage by night, and is the only channel suitable at all times for vessels of heavy draught. Having arrived at a fairway abreast Happisburgh, steer to pass outside Newarp light-vessel; should the wind be strong from the eastward, keep over towards the Would light-vessel, so that the ship may pass 2 or 3 miles to windward of Newarp light-vessel; care must, however, be taken while proceeding out, that Happisburgh lighthouse be kept on about a W. by N.  $\frac{3}{4}$  N. bearing, and that the ship does not pass to the north-eastward of the Would light-vessel in order to avoid the south end of Haisborough sand. Having rounded Newarp light-vessel, continue on for fully  $7\frac{1}{2}$  miles, or till Winterton lighthouse appears to the northward of N.W., before bringing Newarp light-vessel to the eastward of North, so as to clear Cross sand. Then the general coasting course, S.S.W.  $\frac{3}{4}$  W., may be steered. (*See* page 229.)

In fine weather, and westerly winds, Newarp bank may be crossed, thus avoiding the long round to leeward of Newarp light-vessel. In crossing the bank keep Winterton lighthouse to the southward of West, or Cockle light-vessel to the southward of S.W. by W.  $\frac{1}{2}$  W. There is not less than 6 fathoms on the shoalest part of the bank, a description of which is given at page 225. During stormy weather the sea breaks here, and it must then be avoided.

Bound into the Would from outside Yarmouth sands, and having sighted Newarp light-vessel, keep her to the westward of North until she has been passed, then steer N.W. by N. between the Would light-vessel and the shore. Should the wind in such a case be scant from the westward, the seaman must be careful to keep Newarp light-vessel after passing her to the eastward of S.S.E., and to pass to the south-westward of Would light-vessel, to insure clearing Haisborough sand.

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\* Described at pages 224 and 229.

**Anchorage.**—There is good anchorage in the Would in off-shore winds between Winterton and Bacton, and even with easterly winds this part of the coast is somewhat protected by the Haisborough sand ; northerly and north-westerly winds cause the greatest sea.

**TIDAL STREAMS.**— In Haisborough gateway the general directions of the flood and ebb-streams are S.S.E. and N.N.W., setting fairly through it, but across the Newarp sand. The latter circumstance must be carefully attended to while closing Newarp light-vessel. The flood-stream in the gateway runs to the southward whilst the tide is rising at Dover, and the ebb-stream to the northward when the tide is falling at Dover ; the average rate in common springs being 3 knots per hour.

Outside the Haisborough sand, Hammond knoll, and Winterton ridge, lie other dangerous shoals, viz., the Leman, Ower, and Smith knolls, whilst between them are some banks known as Hewett ridges ; these will now be described, and then the coast navigation again resumed.

The **LEMAN BANK** is, within the 10 fathom contour line, a ridge of upwards of 20 miles long, N.W. by N. and S.E. by S., but within the contour line of 5 fathoms, which may be considered the dangerous part of the shoal, is 12 miles long, and three quarters of a mile in width at its widest part. The south-eastern extremity, in 5 fathoms, which is marked by a *can* buoy painted *black* and *white* in *vertical stripes*, is in lat.  $53^{\circ} 2' 50''$  N., and long.  $2^{\circ} 8' 30''$  E., and its north-western 5-fathom extremity, which is marked by a *can* buoy *chequered black* and *white* with *staff* and *cage*, is in lat.  $53^{\circ} 9' 15''$  N. and long.  $1^{\circ} 52' 7''$  E.\* There are two elbows in this bank, both convexing to the south-westward ; the northern elbow is the shoalest part of the Leman, where a depth of only 9 feet for the extent of a quarter of a mile exists. Between these elbows the prevailing depths are 12 to 18 feet, and from each of them to the corresponding extremities of the bank, the depth gradually increases to 4 fathoms ; the bank is “steep-to,” especially to the north-eastward.

A vessel nearing the Leman from the westward may, by keeping the lead going, have warning of her approach to it ; but on the eastward side the bank is so steep that she may strike the ground before soundings are obtained, particularly with a flood-stream running. It

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\* For position of buoy, see p. 249.

is a remarkable feature of this bank, that throughout its whole extent the shoalest water is on its eastern side, so that in crossing it from the westward, as soon as the shoalest cast is obtained, the lead will immediately drop into 18 and 20 fathoms near the southern end ; into 13 and 14 fathoms between the elbows ; and into 15 and 16 fathoms near the northern end ; the steepest part of the bank being near the northern end, where 20 fathoms is to be found within a short distance from either side of it.

From the north-west end of the shoal part of the Leman, Cromer lighthouse bears W. by S.  $\frac{1}{2}$  S., distant  $24\frac{1}{4}$  miles ; and Haisborough light-vessel S.W. by W.  $\frac{1}{3}$  W.,  $14\frac{1}{2}$  miles. From the south-east end, in  $4\frac{1}{2}$  fathoms, Haisborough light-vessel bears W.  $\frac{1}{2}$  N., distant  $20\frac{1}{4}$  miles ; and Newarp light-vessel, S.W., 20 miles. The last-mentioned course leads close to the south-eastward of the 5-fathom patch upon the outer Hewett ridge, and to the south tail of Hammond knoll.

**The OWER BANK** is far more dangerous, and also more irregularly formed, than the Leman. Within the contour line of 10 fathoms it is 23 miles long in a general N.W. by N. and S.E. by S. direction, and 2 miles in width at its broadest part ; but within the contour line of 5 fathoms is 11 miles in length. Its southern extremity, which is marked by a *black conical* buoy, in 5 fathoms, is in lat.  $53^{\circ} 7' 10''$  N., and long.  $2^{\circ} 6' 30''$  E., and the northern extremity of the 5 fathom edge is in lat.  $53^{\circ} 14' 10''$  N., and long.  $1^{\circ} 52' 30''$  E. A little over a mile to the southward of the northern extreme, and on the eastern edge of the Bank, is a *black conical buoy with staff and globe* in 13 fathoms.\* This bank has also two elbows, both lying in nearly the same parallel of latitude, viz.,  $53^{\circ} 10' 30''$  N., the eastern one, which is marked by a *black conical* buoy, being in long.  $2^{\circ} 1' 30''$  E., and the western one in  $1^{\circ} 55' 30''$  E. ; the eastern elbow convexes to the north-eastward, and the western to the south-westward, by which features, and their relative bearings, the Ower may be readily distinguished from the Leman, when breakers or the strength of the stream show the positions of the banks.

From the southern end to the eastern elbow, the Ower, like the Leman, has its shoalest water on the eastern side, the prevailing depths being from 11 to 15 feet. The southern shoal ridge then

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\* For positions of the buoys, see the end of this chapter, p. 250.

terminates, and there is a swatchway between it and the south-western elbow of 4 fathoms, about a mile in width. On the south-western elbow, which is 2 miles long by half a mile wide, the depth is only 7 feet. To the northward of the south-west elbow, the bank is more regularly formed; still, however, the eastern side is the steepest, and most difficult to approach by the lead. The whole shoal is shown very conspicuously by breakers when the sea is running.

That portion of the bank between the southern end and the western elbow, has its position indicated by smooths and ripples during the strength of the stream, as is also the case with the Leman; but to the northward of this elbow the bank is not so strongly marked, by reason of its more regular formation, and the stream of the tide not setting so obliquely across it.

The northern extremity of the Ower bears from that of the Leman N. by E.  $\frac{1}{2}$  E., distant 5 miles; and the shoalest patch of the Ower bears from that of the Leman N.N.E.  $\frac{1}{4}$  E.,  $3\frac{1}{4}$  miles.

In the vicinity of the Ower and Leman banks, as well as over the Well and Swarte banks and Smith's knoll, the Yarmouth fishing smacks are constantly met with. In fine weather these smacks, which draw about 10 feet of water, cross all parts of the Leman and Ower, excepting the shoal knoll of 7 feet.

**LEMAN and OWER LIGHT-VESSEL** is moored between the sands, but nearer the south-east tail of the Ower, in 16 fathoms; in lat.  $53^{\circ} 7' 57''$  N., long.  $2^{\circ} 2' 0''$  E.; S.E. by S. 5 miles from the shoalest spot upon the Ower, and E. by S.  $\frac{1}{3}$  S.,  $4\frac{1}{3}$  miles from the shoalest spot upon the Leman. She exhibits one *white* light, which shows *two flashes* in quick succession *every half-minute*, at 38 feet above the sea, and is visible in clear weather at the distance of 11 miles.

The attention of the seaman is particularly directed to the character of this light being *group flashing*. The *two flashes* occur quickly one after the other, and are followed by a comparatively long interval of darkness; the intervals being, approximately—*two and half seconds* of light, *five seconds* of darkness—*two and half seconds* of light, *twenty seconds* of darkness.

**Fog Signal.**—In thick or foggy weather, a gong is sounded.

The vessel has two masts, the after mast being the shortest, and

during the day carries a ball at each masthead. The top of the highest ball is 79 feet above the water line.

From the light-vessel the south-east Ower buoy bears S.E. by E., distant  $2\frac{8}{10}$  miles; the north-west Ower buoy, N.N.W. (westerly),  $7\frac{1}{4}$  miles; the Owers Watch buoy, N.E. by E.  $\frac{1}{2}$  E., 6 cables (this is a *can buoy with black and white vertical stripes*); north-west Leman buoy, N.W. by W.  $\frac{1}{3}$  W., 6 miles; south-east Leman buoy, S. by E.  $\frac{3}{4}$  E.,  $6\frac{1}{4}$  miles; Haisborough light-vessel, W. by S.  $\frac{1}{4}$  S.,  $18\frac{3}{4}$  miles; Newarp light-vessel, S.S.W.  $\frac{3}{4}$  W.,  $23\frac{1}{4}$  miles; and Smith's knoll light-vessel S.  $\frac{3}{8}$  E.,  $17\frac{1}{2}$  miles.

**CAUTION.**—It must be remembered that as the light-vessel is placed in the midst of the shoals, and is only intended to mark their general position, it is not advisable to approach her in any direction, either by night or by day.

**TIDES.**—At the Ower and Leman light-vessel it is high water at full and change at 7.15, but the tidal stream does not depend on the local high and low water, but on the high and low water at Dover, so that the south-going stream is always running whilst the tide is rising at Dover, and the north-going stream when the tide is falling at that place. Consequently at high and low water at the Ower and Leman the stream is at nearly its full strength.

The general direction of the flood or south-going stream is from S.S.E. to S.S.W., and of the ebb or north stream from N.W. by N. to North. The action of the stream is rotatory, the last of the south-going stream turning to the westward, and the last of the north-going to the eastward, or with the hands of a clock.

The following table shows the direction of the stream as observed in H.M.S. *Triton*, during the survey of the banks in June 1884:—

After high water at Dover.	After low water at Dover.
hour.	hour.
1 N.W. by N.	1 S.E. by S.
2 N.N.W.	2 S. by E.
3 N.N.W.	3 South.
4 N.N.W.	4 S.S.W.
5 N.N.W.	5 S.W. by S.
6 North.	6 W. by S.

**INNER, WELL, BROKEN, and SWARTE BANKS,** are ridges, having respectively 4, 3, 5, and 6 fathoms upon them, lying 2, 4, 8, and 14 miles to the eastward of, and parallel to, the Leman and Ower. The greatest depths between these ridges are from 20 to 22 fathoms, and if the lead be used in good time they may be identified, and thus serve to indicate the approach to the above dangerous shoals.

**SMITH KNOLL** is a narrow ridge 20 miles long, 8 miles east of Winterton ridge. The north-west end of the shoal, with 9 fathoms upon it, is to the south-westward of, and separated by a channel 4 miles wide from, the south-east extremity of the Leman, and from it Haisborough light-vessel bears W.  $\frac{3}{4}$  N., distant 15 miles, and Leman and Ower light-vessel, N.N.E.  $\frac{1}{4}$  E.,  $7\frac{1}{2}$  miles. From this point the direction of the shoal for  $5\frac{1}{2}$  miles is S.E., then S.  $\frac{3}{4}$  E. for  $6\frac{1}{2}$  miles, and for the remaining 8 miles S.  $\frac{1}{2}$  W.; it ends in 10 fathoms, with Newarp light-vessel bearing W.N.W., distant  $13\frac{1}{2}$  miles. The least water ( $2\frac{3}{4}$  fathoms) is nearly midway along the shoal, with Newarp light-vessel bearing W. by S.  $\frac{1}{4}$  S., distant  $13\frac{3}{4}$  miles, from whence it deepens gradually towards the extremities. The ridge is scarcely more than half a mile wide in any part; there are depths of 23 and 24 fathoms within one mile on the east side, and about 5 fathoms less at the same distance from the western side. This is a favourite fishing ground.

**LIGHT-VESSEL.**—A light-vessel in lat.  $52^{\circ} 52' N.$ , long.  $2^{\circ} 13' 30'' E.$ , is moored in 25 fathoms, one mile to the eastward of the shoal-water on Smith's knoll. The vessel is painted red with Black upper works, and the words Smith's knoll in white letters amidships, and carries at the masthead a black ball. She exhibits a *double flashing* light giving one *red* and one *white* flash *every twenty seconds*, as follows:—A *red flash of one and a half seconds*, an *eclipse of five seconds*, a *white flash of one and a half seconds*, and an *eclipse of twelve seconds*.

**Fog Siren.**—In foggy weather a siren is sounded twice every *two minutes*, the first blast being a *high note*, instantly followed by a *low note*. The light is elevated 40 feet, and visible 11 miles.

From Smith's knoll light-vessel the Leman and Ower light-vessel bears N.  $\frac{3}{4}$  W., distant  $17\frac{1}{2}$  miles; South Winterton ridge buoy, W. by S.,  $7\frac{3}{4}$  miles; Newarp light-vessel, W. by S.,  $14\frac{1}{4}$  miles; Cross Sand light-vessel, S.W. by W., 18 miles; Lowestoft High lighthouse, S.W.  $\frac{3}{4}$  W.,  $28\frac{1}{4}$  miles.

**Buoy.**—On the west side of Smith knoll is a *spherical* watch buoy, *striped horizontally black and white* in 4 fathoms. From the buoy the light-vessel bears East  $1\frac{1}{10}$  mile.

**TIDAL STREAMS.**—The rate of the tidal stream at the south end of Smith knoll is  $2\frac{1}{2}$  knots per hour at springs, and one knot at neaps. The sets near the north-west end are north and south, and about the middle and south end N.N.E. and S.S.W., drawing in each case, during the latter part of the flood, more to the westward, and of the ebb to the eastward, or rotating in the direction of the hands of a clock in a precisely similar manner to the stream at the Leman and Ower, and over the whole of the Would; they are much influenced by the wind.

**The MIDDLE GROUND** of the fishermen lies between Smith knoll and Winterton ridge; the depths over it are from 18 to 20 fathoms, and the bottom is fine brown sand and clay.

**HEWETT RIDGES** are two shoal ridges between the north-west end of Smith knoll and Hammond knoll; the outer one, 10 miles long, lying in a north-west and south-east direction, has patches of 5 fathoms; the other, lying N.W. by N. and S.E. by S., is 5 miles long, and has 7 fathoms upon it; they are so situated that they form three channels of nearly equal breadth between Hammond and Smith's knolls, with 17 to 20 fathoms in them.

## YARMOUTH AND YARMOUTH ROADS.

Winterton ness, which, with its conspicuous church and lighthouse, is described on page 205, is not only the southern boundary of the western side of the Would, but is also the northern boundary of the extensive series of shoals, with the channels between them which form the well-known roadstead of Yarmouth, with the gateways leading to it; for, fronting the whole coast from nearly abreast Winterton to Covehithe-ness, 21 miles to the southward, are a series of sand-banks, from half a mile to two miles from the shore, which form a sort of barrier against the heavy sea which would otherwise be sent home to the coast in gales from the eastward. The various channels through this barrier are locally termed gateways. The

depths on this barrier, or natural breakwater, vary from spots where it is almost dry at low-water to a depth of 12 feet, but it is subject to much change; in some years the shoal spots of previous years disappear, whilst the deeper parts become shoaler. Unfortunately, it appears to have a general tendency to wash away, as the depths over the whole barrier are certainly more than they were 50 years since, and it is evident that the anchorage in Yarmouth roads will become less and less secure as the natural barrier gradually disappears. This, however, is not likely to happen quickly, and it is possible that a series of easterly gales for some consecutive years might again pile up the sand on the Scroby and other shoals forming the barrier. Only a series of accurate surveys can show what is occurring, and perhaps suggest a remedy, and, unfortunately, our series does not extend over a period sufficiently long for the purpose.

The coast and dangers close to the shore will be described first and then the off-lying sand-banks, the whole of which are so well marked artificially by buoys and light-vessels, that there is little difficulty in using the various channels in moderately clear weather.

**CAISTER.**—Sand-hills bound the shore from Winterton to Caister, and the towers of Hemesby and Ormesby churches appear above them. The most conspicuous object on the coast is the California look-out. These look-outs, which are all of the same character, are small huts on the top of piles driven into the ground, to enable the men on shore to keep a look-out for wrecks and vessels in distress in the offing, and to send assistance to them. The sand-hills end at Caister, and a low sandy beach extends from thence to Yarmouth. Caister, though now an unimportant village, was the principle station of the Romans in the country of the Iceni. Caister castle was the seat of Sir John Fastolfe, famous in the French wars of Henry V. and VI., who was made a Knight of the Garter for his share in the taking of Granville. Fastolfe is supposed to be the original of Shakespeare's Falstaff. Caister coastguard watch-house upon the end of the sand-hills, the church, and windmill, are the chief objects visible from the sea.\*

**Life-Boats.**—A life-boat, rockets, &c., are stationed at Caister; and there is also a life-boat station between Caister and Yarmouth.

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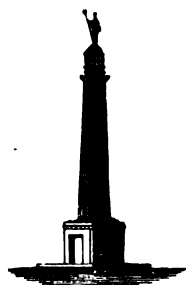
\* See Admiralty chart of Yarmouth and Lowestoft roads, No. 1,543; scale, mile = 1 inches; with plans of Yarmouth haven, and Lowestoft harbour.



**YARMOUTH** stands upon a low narrow strip of land between the Yare and the sea, on what was a detached sand-bank till the eleventh century, and there are various remains which prove that the sea, at a remote period, filled the valleys of the Waveney, Yare, and Bure, its exclusion being probably due to change in the disposition of the sands, and also to a series of progressive embankments. The town, 2 miles from the mouth of the Yare on its left bank, is about one mile long and half a mile across; its early prosperity was entirely due to the herring fishery, but this is now divided by its popularity as a watering-place, for it holds as prominent a position in Norfolk as Scarborough does in Yorkshire; it is connected by a lift-bridge with the suburb, Southtown, and thereby with Gorleston, at the mouth of the river. Formerly it was a walled town, and portions of the wall yet remain, but the greater part has long since disappeared. There are numerous windmills and several factory chimneys in the immediate neighbourhood; and among the principal objects in the town are, the fine old church of St. Nicholas, with its conspicuous spire, the Naval hospital, Militia barracks, Trinity look-out tower, and Nelson monument, 144 feet high, erected in 1817. Gorleston church is also very conspicuous. Several handsome terraces front the sea, and there are batteries to the north and south of the town.



St. Nicholas church, Yarmouth  
W.  $\frac{1}{2}$  N., 1 mile.



Nelson monument, N.N.W.,  
1 mile.

**Supplies.**—Fresh water is supplied to the town from Ormesby broad, and is laid along the quays of the haven as far as the south end of the fish market. It can be readily procured in the haven, but is not sent off to the roads—price 2*s.* 3*d.* per ton. Coals can always be obtained, and vessels may coal in any part of the haven. Only North country coals are kept in stock, and the price is high, 16*s.* to 18*s.* per ton. All other supplies are plentiful, and the market, held on Saturdays, is as good as any in England.

**Piers.**—Wellington pier, a short distance to the southward of Yarmouth jetty, and Britannia pier at the north end of the town, are both favourite promenades of visitors; the head of the latter pier is marked by a *fixed green* light, and on it is a *red* leading light for Caister shoal.

There is an excellent Sailors' Home at Great Yarmouth, and, when suffering from illness, seamen are received into the Yarmouth Hospital (supported by voluntary contributions).

**Time Signal.**—A ball is dropped daily at 10 a.m., G.M.T., Sundays and general holidays excepted. This is maintained by private enterprise.

**Signal Station.**—At Yarmouth is a signal-station with which passing vessels may communicate by means of the International Code. See footnote, page 121.

**Life-Boats.**—Two life-boats, with rockets, &c., are stationed here, and there are also two life-boats at the haven.

**LEADING LIGHTS.**—A *fixed red* light is exhibited from a lantern on the top of the Sailors' Home, Yarmouth, at an elevation of 60 feet above high-water; and another *fixed red* light is shown from the north side of the Britannia pier, at an elevation of 20 feet above high-water. These lights in line, bearing S.W.  $\frac{3}{4}$  S., lead nearly two cables eastward of Caister Elbow. They are visible respectively 13 and 9 miles in clear weather.

**YARMOUTH HAVEN** is the common outlet of the rivers Yare, Waveney, and Bure. The Yare has a course of 74 miles; the Waveney and the Bure are each about 50 miles in length; and in the three rivers Yarmouth possesses 123 miles of uninterrupted inland navigation. The Yare and Waveney unite  $3\frac{1}{2}$  miles above Yarmouth, at the upper end of a large expanse named Breydon water; which is 3 miles long and half a mile wide, and is principally occupied by muddy flats; its width becomes contracted near the north end of the town, whence, receiving the waters of the Bure, the united streams flow uninterruptedly to the sea.

Besides its numerous fishing vessels, the port employs a large number of vessels in the foreign and coasting trade; it exports corn and fish, and receives coal, timber, linseed, oil cake, cheese, and salt. Aggregate value about £226,000. Yarmouth derives additional importance from its being the chief rendezvous for the British, French, and Dutch fishing vessels; the inland trade also is considerable.

Ship-building is extensively carried on, as well as malting. Vice-consuls for most foreign nations are resident. Steamers trade weekly to London, Hull, and Newcastle, and in the summer daily between Yarmouth and London.

The average number of vessels entering the port annually (exclusive of fishing vessels) is 1,200, of an aggregate tonnage of 160,000. In 1883, 1,020 fishing vessels, of 70,336 tons, also entered. On the 1st of January, 1881, 706 vessels, of 30,249 tons, belonged to the port. Population, 46,211 in 1881.

Yarmouth haven was of importance at an early period, and has undergone numerous changes, the entrance having successively occupied seven different positions. The south pier, built in 1566, extends in an easterly direction nearly at a right angle to the lower reach of the river, and is 450 yards long ; the north pier was built in 1815, and lengthened in 1824 and 1868 ; it is 200 yards long, and projects 100 yards farther eastward than the south one ; both piers are of wood, but the north pier is now (1887) being re-constructed of concrete ; the distance between them is 250 feet, but the clear width is contracted by fender piles to 209 feet.

**Docks.**—There are numerous small docks in the haven (used principally by fishing smacks), and one of moderate size, 250 feet long, 35 feet wide, with a depth of  $11\frac{1}{2}$  feet over the sill at high-water, springs.

**Patent Slip.**—There is a patent slip for vessels up to 800 tons.

**Lights and Signals.**—A *red* flag is exhibited from the flagstaff on the south pier during the time the tidal stream is running into the haven. At night time the following lights are shown :—

(a) A *fixed red* light is shown from sunset to sunrise from the lighthouse at the outer end of the south, or Gorleston, pier. This light is elevated 30 feet above high-water.

(b) An additional light is shown, from a window, 10 feet below the upper light, in the same lighthouse ; the colour and exhibition of which depends on the state of the tidal stream. When the stream is running into the haven this light is *red* ; when the stream is running out of the haven the light is *green* ; when the height of the tide is below one foot on the harbour tide gauge, or when gales or strong winds from seaward, raise a sea high enough to make it dangerous to attempt the harbour, the *green* light will not be shown. The light exhibited from this window is cut off in the direction of the St.

Nicholas light-vessel, and is not visible when to the southward of a W. by S. bearing.

(c) A *fixed red* light, 64 feet above high-water, is exhibited from sunset to sunrise from a red-brick tower, recently erected (1887), near the Brush wharf. This light is W. by N.  $\frac{1}{4}$  N., 270 yards from the lighthouse on the end of the south, or Gorleston, pier. When kept in line with that light it leads in the deepest water up to the south pier.

In case of obstruction either within or without the harbour, all lights will be extinguished at night; whilst in the day the red flag will be lowered, and *two black balls* will be shown from the flagstaff on the south pier.

**Bar.**—A bank named the North stretches to the north-eastward from the north pier-end. A *black* conical buoy, marked North Bank, lies to the eastward in  $5\frac{1}{2}$  fathoms at low-water.\* A south-westerly extension of this bank, continued across the entrance of the haven, forms the bar, a flat of shingle and sand, from 200 to 300 feet in breadth, and which is longer or shorter according to the prevalence or otherwise of northerly winds. In 1828 the bar used to dry, and there was as little as 6 feet upon it as late as 1836; but now, owing to the improved state of the channel above, a depth of 10 feet at low-water is steadily maintained, and vessels drawing 14 to 16 feet are able to enter during spring tides. The direction of the entrance is E.  $\frac{1}{2}$  S. and W.  $\frac{1}{2}$  N., but the deep water into the haven approaches close to the south pier-head from a south-easterly direction.

For some years past improvements in Yarmouth haven have been steadily carried out. Many impediments have been removed, shoals have been cut through, the bed of the river has been made generally uniform in width and depth, the former averaging 270 feet from the pier to the town, and the latter having been increased from 8 to 11 feet at low-water; the banks have also been protected by sheet piling.

The waterway of Yarmouth bridge has also been increased from 146 feet to 180 feet, and the lifting portion of the bridge is 50 feet across. Though much has by these means been effected, the accommodation is still insufficient for the trade of the port; and the Brush, the abrupt turn at the inner end of the south pier, yet remains as a serious impediment to the navigation.

Vessels are berthed in the haven alongside the wharves, and all

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\* For position of this buoy see the end of this chapter, p. 250.

have to lie with their heads to the southward, to top up their lower yards, brace up the other yards, and turn in their boats and anchors ; when anchors are let go they are to be buoyed.

The aid of a pilot is necessary for strangers in entering Yarmouth harbour, not only for the navigation, but for berthing the vessels inside, and pointing out the proper position to swing, as there is only just width enough in the river to do so ; few accidents, except of a trifling nature, occur. Light draught vessels and small craft may enter at most times, but loaded vessels should not attempt it when there is a heavy sea upon the bar, especially as the noble roadstead in front renders the doing so for refuge unnecessary. Risk is also incurred by attempting the harbour when the ebb stream is running out, as it strikes a vessel on the port bow, and forces her over towards the "North." The best time to enter the haven, if the draught is suitable, is at slack low-water. The sharp turn at the Brush into the river proper requires care, and a hawser should always be in readiness to check the vessel. The haven is almost always well filled with shipping, particularly in the herring season, September to December.

Steam tugs are commonly used.

At Yarmouth is the Trinity Establishment for the buoys, beacons, and light-vessels from Flamboro' head to Covehithe.

**TIDES.**—In the haven, the stream makes in till it is high-water at Dover, and out until low water at that place, notwithstanding the tide is falling or rising in the haven. Thus vessels entering the haven at high or low water by the shore experience the disadvantage of the full strength of the stream setting across the entrance, and into or out of the haven.

The sea level remains nearly stationary from about an hour before until about an hour after, both high and low water by the shore. The tidal streams are very strong at springs.\*

**Pilots.**—The pilotage service at Yarmouth is conducted by 28 pilots, half of whom are also qualified to take charge of vessels through the various gateways connected with Yarmouth road. They are licensed by the Trinity Corporation of London.

**Gorleston** stands upon the steep right bank of the Yare, near its outlet. The church with three gables, is a plain object. Cliff of one general height extends from Gorleston to Corton.

**Lifeboat.**—A lifeboat is stationed at Gorleston.

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\* For further remarks on the tides see p. 230.

## YARMOUTH SANDS.

The numerous sands lying parallel to the shore, the main body of which (shallow at low-water) cover in and defend the invaluable anchorage, Yarmouth road, will now be described.\*

**WINTERTON OVERFALLS** lie between Winterton shoal and the north end of the Scroby. This shoal is generally marked by strong rippings, and by a breaking sea when the ebb stream is opposed by a north-east wind. The depths on the north-eastern edge of this sand have decreased considerably, and a patch of 26 to 30 feet lies with the following bearings and distances:—Cockle light-vessel S.W.  $\frac{2}{3}$  W.,  $1\frac{6}{10}$  mile, Winterton lighthouse W. by N.  $\frac{1}{2}$  N., distant  $3\frac{7}{10}$  miles; N. Cockle buoy N.W. by W.  $\frac{1}{2}$  W., distant  $1\frac{2}{10}$  mile.

**COCKLE SAND**, the northernmost of the dangers, lies inshore to the southward of Winterton-ness. Its north end, in 5 fathoms, is E.  $\frac{1}{3}$  S.,  $1\frac{8}{10}$  mile from Winterton lighthouse, from whence its outer margin trends south for  $1\frac{1}{4}$  mile, and then in a general S.W. by S. direction for half a mile, when it joins the Caister shoal, and leaves a swatchway between it and the Caister of 20 feet at low-water. The least water on the Cockle is 8 feet, rather to the southward of the centre of the shoal. It is marked by a *spherical* buoy,† painted *black and white* in horizontal stripes, with *staff and diamond*, at its north end; by two *conical black* buoys on its east side, and a *can* buoy, painted *red and white with vertical stripes*, on its south-west side.

**CAISTER SHOAL**, which extends out from the coast about a mile to the southward of Caister, then for  $2\frac{1}{4}$  miles in a N.E. by N. direction and then  $1\frac{1}{2}$  mile in a N. by W. direction, is nearly dry in parts at low-water, and almost joins the Cockle shoal. Between the Caister and the shore is a blind channel a quarter to a half a mile in width. It is marked on its eastern side by four *conical black* buoys, the northern of which has a *staff and globe*. Both the Cockle and Caister shoals, and the swatchway between them, are subject to constant change.†

**COCKLE LIGHT-VESSEL**, which lies in 8 fathoms to the

\* **Caution.**—The sands and channels in the vicinity of Yarmouth and Lowestoft are subject to frequent change; the charts and sailing directions must therefore be used with great caution.

† For positions of buoys, see pages 250 and 251.

south-east of Cockle shoal and off the north end of the Scroby, exhibits a *revolving white light every minute*, at 35 feet above the water, and which may be seen 10 miles off in clear weather. This light-vessel marks the Cockle gateway, the channel between the Cockle and Caister shoals, to the westward, and the Scroby to the eastward, into Yarmouth roads. The Gateway is 3 miles long and half a mile wide.

**Fog Signal.**—A gong is sounded during thick or foggy weather.

From this vessel, Nelson monument is on with Britannia pier-head, bearing S.S.W.  $\frac{1}{2}$  W. ; and Winterton church is touching the west side of Winterton lighthouse, N.W.  $\frac{1}{4}$  W. ; Newarp light-vessel, N.E. by E.  $\frac{3}{4}$  E., distant  $5\frac{6}{10}$  miles.

**SCROBY**, on the east side of Cockle gateway, is the next sand to the southward, and forms the principal defence to Yarmouth road. The long and narrow northern extremity of this sand begins abreast the southern end of the Cockle sand, and just S.E. of Cockle light-vessel ; 3 fathoms upon it is S. by E.  $\frac{1}{2}$  E. nine cables from that vessel ; from thence the inner or western face of the sand extends (curving to the eastward) S. by W.  $\frac{1}{2}$  W.,  $5\frac{1}{2}$  miles, and then about S. by E.  $\frac{1}{2}$  E. for  $2\frac{1}{4}$  miles to the southern termination. Portions of the sand, named North, Middle, and South Scroby, have from 5 to 1 feet upon them at low-water, and its breadth increases gradually from one-quarter mile to upwards of one mile near the middle of the shoal, when it again forms into a narrow ridge at the southern end. The western edge of the southern end of this shoal forms the eastern boundary of the Hewett channel, the deepest passage from Yarmouth roads to sea to the southward.

This shoal is marked by *nine can buoys, painted black and white*, on its western edge, and by a *spherical buoy, painted in black and white horizontal stripes, with staff and inverted triangle*, at its south extremity. Three of the *can buoys* have *staves with cages*.\*

**CORTON SAND**, which forms the eastern side of Gorleston road and the western side of Hewett channel, has its north end in 3 fathoms, E.S.E.,  $1\frac{1}{2}$  mile from the entrance of Yarmouth haven ; this portion is sometimes a distinct shoal, known as St. Nicholas bank, and is sometimes continuous with the other parts of the Corton. The Corton, which is irregular in form, is 3 miles long in a north and south direction, and about half a mile wide. The least water on it,

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\* For positions of buoys, see p. 251.

9 feet, is E. by N.  $2\frac{1}{10}$  miles from Corton church. The Corton sand is marked by a *spherical* buoy, painted *black and white in horizontal bands*, and with *staff and diamond*, at its north end ; by *three black conical* buoys on its eastern side, and by *two can* buoys, painted *red and white*, on its west side.\*

**ST. NICHOLAS LIGHT-VESSEL**, for marking the passage through Hewett channel, lies in 10 fathoms, one mile within the north end of Corton sand. The principal light is *white, fixed*, 36 feet above the water, and may be seen at the distance of 11 miles in clear weather ; there is also a *red* distinguishing light, *flashing every ten seconds*, shown at a height of 16 feet from near the stern of the vessel.

**Fog Signal.**—A gong is sounded during thick or foggy weather.

From the vessel, St. Nicholas church tower is its breadth westward of the Roman Catholic chapel at Yarmouth, bearing N.N.W.  $\frac{1}{3}$  W. ; Gorleston church tower is in line with the south end of the petroleum store on Yarmouth south denes, W.  $\frac{3}{4}$  N. ; Corton light-vessel S. by E.  $\frac{1}{2}$  E.  $4\frac{1}{10}$  miles.

**CORTON LIGHT-VESSEL**, for assisting in the navigation of Hewett channel, and for keeping vessels to the eastward of the sands, lies one mile outside Corton sand, in  $12\frac{1}{2}$  fathoms ; she exhibits a *red* light, which revolves *every twenty seconds*, at 37 feet above the water, and is visible at the distance of 11 miles in clear weather ; she carries a half-ball *under* the usual ball at her mast-head.

**Fog Signal.**—A gong is sounded during thick or foggy weather.

From this vessel, Gorleston church tower is its breadth westward of the lighthouse on the south pier-head at Yarmouth haven, bearing N.W. by N. ; St. John's church is in line with Lowestoft low lighthouse, S.W. by W.  $\frac{1}{3}$  W. ; Cross Sand light-vessel bears N.E.  $\frac{3}{4}$  N., distant  $7\frac{2}{10}$  miles ; and St. Nicholas light-vessel, N. by W.  $\frac{1}{2}$  W.,  $4\frac{1}{10}$  miles.

The Newarp and Cross sand shoals, lying outside to the eastward of the Scroby, will now be described.

**NEWARP BANK**, to the north-eastward of the Scroby, constitutes the south-western boundary of Haisborough gateway. From the depth of 6 fathoms (the shoalest part) Winterton lighthouse bears W. by S.  $\frac{1}{2}$  S., distant 7 miles ; Happisburgh lighthouse,

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\* For position of buoys, see p. 253.



N.W. by W.  $\frac{1}{2}$  W., 12 miles ; Would light-vessel N. by W.  $\frac{3}{4}$  W., 4 miles, and Newarp light-vessel S.  $\frac{3}{4}$  E.,  $1\frac{1}{4}$  mile. The bank is  $1\frac{1}{2}$  mile in length and three-quarters of a mile in breadth, the general depths over it being 8 and 9 fathoms.

**NEWARP LIGHT-VESSEL**, placed in 1790, both to mark the position of Newarp shoal, and to serve as a mark through Haisborough gateway is moored in 17 fathoms at low-water, and is a group *flashing white* light, showing *three flashes* in quick succession, followed by an eclipse of *thirty-six seconds*, the whole revolution occupying *one minute* ; it is elevated 39 feet above the sea, and may be seen 11 miles off in clear weather.

**Fog Signal.**—A fog-siren is sounded in thick weather, giving *three* blasts in quick succession *every two minutes*, and should accident occur to the apparatus the gong will be substituted until repairs are effected.

The three masts, the highest in the middle, each carrying a ball, have been retained in this vessel to distinguish her by day. The ball at the mizen is 6 feet lower than that at the foremast head. She is moored in 17 fathoms, S.  $\frac{3}{4}$  E.,  $1\frac{1}{4}$  mile from the Newarp, with Happisburgh lighthouse, bearing N.W.  $\frac{3}{4}$  W. (westerly) distant 13 miles ; Martham church, open to the northward of Winterton church three times the apparent length of the latter, West ; and Gorleston church, open to the westward of Nelson monument, S.W. The distance at which this vessel should be passed has been given on page 210.

**CROSS SAND**, the outermost of the shoals abreast Yarmouth, is separated from the Scroby by a deep and unsafe channel, named Barley Picle or Pightel. It is marked on its eastern edge by 5 large *conical black* buoys, two of which are surmounted by staves, &c. Commencing at the Newarp light-vessel it extends 11 miles in a general S.S.W. and S.W. by S. direction, its southern extremity nearly joining the tail of the Scroby. The northern end of the sand has 27 to 23 feet on it ; near the middle of the shoal is a patch which almost dries ; there are other patches of 4 and 13 feet towards its south-west end. Its greatest breadth is  $1\frac{1}{2}$  mile.

**LIGHT-VESSEL.**—A light-vessel painted red with two broad vertical stripes in black on the sides (one forward and one well aft), and with the words *Cross Sand* in white letters amidships, lies in  $19\frac{3}{4}$  fathoms one mile to the eastward of the shoal part of the Middle Cross sand

with Martham church in line with a white gabled house at Scroby N.W.  $\frac{1}{2}$  W. The high mill at Southtown, Yarmouth, in line with the southern half of the aquarium West (northerly) Newarp light-vessel N. by E., distant 7 miles ; Corton light-vessel, S.W.  $\frac{3}{4}$  S.  $7\frac{1}{4}$  miles. She exhibits, at an elevation of 38 feet a *double-flashing white* light every *half minute* as follows :—A flash of *five seconds* duration, an eclipse of *six seconds* duration, a flash of *one and a half seconds* duration, followed by an eclipse of *seventeen and a half seconds* duration. The light is visible in clear weather 11 miles.

The top of the mast is surmounted by two cones with their points together.

**Fog-warning Signal.**—The Cross sand light-vessel being exposed to great risk of collision, especially in thick weather, an explosive warning signal is fired at intervals of not more than *half a minute*, when there is reason to suppose a vessel is approaching dangerously near.

The signal consists of a charge of cotton powder, which explodes with a loud report on attaining the height of about 300 feet.

*This signal is only fired when the crew of the light-vessel believe a collision imminent.*

**YARMOUTH ROAD**, the most important anchorage on the eastern coast of England, is 6 miles long and one mile wide, a space sufficient for the accommodation of a numerous fleet ; from 1,000 to 1,500 sail of colliers and other vessels were formerly occasionally at anchor in it. The bottom is a mixture of sand, mud, and stones, and a berth may be taken up in any part of the road with nearly equal safety.

In strong easterly winds, a better anchorage will be found under the high part of Holm sand abreast Lowestoft-ness, or in Gorleston road under the south Scroby.\*

**CAUTION.**—The accidents that occur in Yarmouth road usually result from one or more of the following causes :—Being anchored too close in ; riding with too short a scope of cable ; being badly found in ground tackling, or neglecting to adopt the common precaution of striking yards and masts on the occurrence of heavy weather. From these combined causes, 25 sail were driven ashore during a north-easterly gale in 1836. It must always be borne in mind that by anchoring in shallow water not only is there more jerk on the cable

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\* Described on page 224.

in a seaway, but that the wave undulation is liable to be transformed into a wave of force. Seven fathoms is the least depth suitable in bad weather in Yarmouth road. The light-vessels are found to ride easiest in 10 fathoms. In selecting the anchorage, if it be possible amongst a crowd of shipping, endeavour to take up a position under the shoalest part of the off lying sand. These as before stated shift about, but are always shown in bad weather by the heaviest breakers.

**Two Life-Boats**, and an ample supply of apparatus for saving life, are constantly kept in readiness near the jetty.

**DIRECTIONS from the Northward.**—Having arrived abreast Winterton, keep Cockle light-vessel bearing S.  $\frac{3}{4}$  W. while closing her, and having passed on the west side of her, keep her bearing N.N.E. northerly, and this will direct through the gateway into Yarmouth road, with the *black conical* buoys on the Cockle and Caister shoals to the westward, and the *black* and *white* can buoys of the Scroby to the eastward.

If approaching from the direction of Haisborough gateway, keep Newarp light-vessel bearing East, until Cockle light-vessel is S.  $\frac{3}{4}$  W., and then proceed as before directed.

Working in, it must be borne in mind that Cockle and Caister shoals are steep-to. The North Scroby may be closed by the lead, or until Nelson monument is in line with the head of Yarmouth jetty, bearing S.S.W.  $\frac{3}{4}$  W.

After passing the Caister shoal anchorage may be taken up as convenient in Yarmouth road; or vessels may proceed through the road and towards the St. Nicholas light-vessel and to sea through the Hewett channel, or to the southward through Gorleston and North Lowestoft road, the directions for which are on pages 230, 238.

**By Night**, close Cockle light upon a S.  $\frac{3}{4}$  W. bearing; pass one cable to the westward of the vessel, and then keep the light bearing N.N.E. northerly, the directing mark through the gateway: it must on no account be brought to the northward of N. by E.  $\frac{3}{4}$  E. on the flood, until well through the passage, nor to the eastward of N.N.E.  $\frac{1}{4}$  E. during the ebb. The two *fixed red* lights at Yarmouth kept in line, S.W.  $\frac{3}{4}$  S., lead two cables clear of Caister Elbow. Winterton light, cut off at the West Scroby buoy, disappears when the most dangerous part of the gateway has been passed. If bound through the roads a course must then be shaped for the St. Nicholas light-vessel and then for the Corton light-vessel, both of which light-vessels may be passed

close to on either side. If bound to Yarmouth road anchor between the light on the Britannia pier and that on the Gorleston south pier at the entrance of Yarmouth Haven. On dark nights it is difficult to distinguish vessels at anchor, as their riding lights get blended with the gas lights on the esplanade.

**CAUTION.**—The tidal streams in Cockle gateway are rapid and cross, that of the flood setting strongly upon the Scroby, and that of the ebb upon Cockle and Caister shoals. Many vessels have been lost upon the sands on either side from not paying sufficient attention to the set of the tidal streams, and the bearing of Cockle light-vessel.

**HEMESBY HOLE**, or Nelson gateway,\* the channel inshore of Cockle and Caister shoals, though subject to constant change, is, when available, much used by vessels of very light draught in scant north-westerly and south-westerly winds, as they thereby avoid the longer round through Cockle gateway. This passage, which is one mile wide near Winterton, becomes gradually contracted to the southward, and the outlet is either through a swatchway between the Cockle and Caister shoals, or between the latter and Caister point. West Cockle Spit buoy (*red and white vertical stripes*) marks the south-west part of the Cockle, which is steep-to. The depths in the Hole, and of the outlet or swatchway, vary according to circumstances; in the former from 9 to 6 fathoms, the latter from 18 to 22 feet.

As the channel runs nearly parallel to the main, no good mark can be given for it, but the frequent changes to which it is subject render this the less necessary. The most available passage over the sands is between Cockle and Caister shoals. After Winterton-ness has been passed, keep 4 or 5 cables off shore till Winterton mill bears N.W.  $\frac{1}{4}$  N.; this mark will lead through the swatchway, in a depth of 18 feet at low-water, into Cockle gateway.

**OUTSIDE YARMOUTH SANDS.**—Having rounded Newarp light-vessel, keep her bearing west of north until the Cross sand light-vessel bears west of S. by W.  $\frac{1}{2}$  W., then steer towards the Cross sand light-vessel, pass her on the east side and proceed S.S.W.  $\frac{1}{2}$  W. towards the Corton light-vessel.

With the exception of a 7-fathoms patch  $1\frac{1}{2}$  mile long, extending S.S.E from near Newarp light-vessel, the prevailing depths outside the Newarp and Cross sand are from 11 to 14 fathoms, but the ground

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\* **Caution.**—See footnote, page 223.

is uneven; a deep gully with 20 to 22 fathoms in it occurs one mile outside the shoals from abreast Newarp light-vessel to abreast the middle part of the Cross sand,—a useful feature while working in this vicinity in misty weather.

**HEWETT CHANNEL,\*** the principal southern channel into Yarmouth road, lies in a N. by W.  $\frac{1}{2}$  W. and S. by E.  $\frac{1}{2}$  E. direction between the south part of the Scroby and the northern portion of Corton sand, and is only one-third of a mile wide at its narrowest part; it had from 25 to 26 feet at low water ordinary springs in 1885. The flood and ebb streams set fairly through it.

**DIRECTIONS.**—Owing to its oblique direction with respect to the adjacent shore, no good leading-mark through the Hewett channel can be given, and moreover the usual misty condition of the weather would generally prevent a leading mark being seen. From a berth one-third of a mile to the south-west of the South Scroby buoy a N. by W.  $\frac{1}{2}$  W. course for  $2\frac{3}{4}$  miles will lead through the channel and to the eastward of St. Nicholas light-vessel.

**At night,** from a short distance eastward of Corton light-vessel, steer N. by W.  $\frac{1}{2}$  W. towards St. Nicholas light-vessel, and the same course continued after she has been passed will conduct to an anchorage in Yarmouth road, or a more northerly one towards Cockle gateway. While proceeding to the northward, do not bring St. Nicholas light to the westward of S. by W.  $\frac{1}{2}$  W. When Winterton light opens out vessels will be past the Scroby Elbow; the Cockle light should then be brought to bear N. by E.  $\frac{3}{4}$  E.

**TIDES.**—It is high-water, full and change, in Yarmouth road, at 9h. 15m., but the streams do not change at high and low water by the shore but at high and low water at Dover; that is the south going stream runs whilst the tide is rising at Dover, and the north going stream whilst the tide is falling at that place. The change of direction of the stream is a little sooner inshore than in the offing, and is liable to be influenced somewhat by the wind.

Similarly in Yarmouth haven, the stream runs into the haven and towards Breydon water whilst the tide is rising at Dover, and out of the haven when the tide is falling there; but the change of the stream is affected much more by winds and rain. On all ordinary occasions the change is simultaneous with the change of stream in the roads,

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\* **Caution.**—See footnote, page 223.

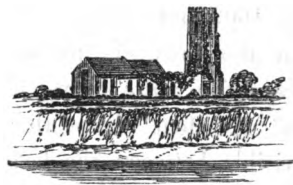
notwithstanding the fact that the water is falling whilst the stream on the surface is running in, or rising whilst the stream on the surface is running out.

For an hour before and after high and low water the height of the water varies very little—less than 6 inches. Springs rise 6 feet, neaps  $4\frac{1}{2}$  feet, and neaps range 3 feet.

The flood-stream being deflected past the entrance of Yarmouth haven by the projection of the North bank and pier, enters the harbour as an eddy from the southward and south-westward, except during strong north-easterly winds and high tides, when it sets directly across the entrance towards the south pier. Common springs rise at the Brush  $5\frac{3}{4}$  feet, and neaps  $4\frac{1}{4}$  feet. At Yarmouth bridge springs rise 5 feet, and neaps 4 feet, the difference between the times of high-water at these places being about 20 minutes. The flow, however, as in the case of all the harbours upon this coast, is greatly influenced by local causes—thus, a north-westerly gale has caused a rise of  $12\frac{3}{4}$  feet at the Brush, and a sudden change of wind has sometimes made a difference in a succeeding high water of 3 or 4 feet. During freshes, the rate of the stream at the Brush is occasionally 6 knots, but on common springs it is  $3\frac{1}{2}$  and 4 knots per hour. The tide flows 32 miles up the Yare to the mill-dam at Norwich, 28 miles up the Waveney to the lock above Beccles, and 36 miles up the Bure to the lock at Caltishall.

**The COAST**, from the entrance of Yarmouth haven to Southwold, is a nearly continuous line of cliffs, composed of sand, gravel, and red loam.

**Corton**—a village between Gorleston and Lowestoft—stands a short distance back from the cliff; the church (partly in ruins) at the north end and the mill at the south end of the village are both prominent objects; and several handsome villas have been erected to the southward. Hopton church is only occasionally visible.



Corton church, S.W., 1 mile.

**Corton Gatway**, which had closed up in 1881, appears to be opening again just northward of its former position. In 1885, there was a channel of 18 to 19 feet, with a least breadth of  $1\frac{1}{2}$  cables, and a depth of 16 feet over a breadth of nearly 4 cables. It is not buoyed.

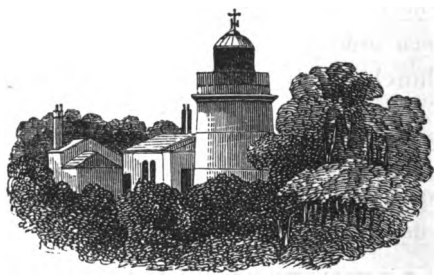
**LOWESTOFT**.—Beach begins to project from the foot of the

cliff abreast Corton, forming at a distance of 2 miles to the southward the low promontory Lowestoft-ness, which is the easternmost point of England. Here a telegraphic cable is landed connecting England with Zandvoort in Holland. The town of Lowestoft, upon the summit and slopes of a steep bank, with much wood about it, shows prominently from every point of view. Its parish church (St. Margaret) in the later English style, with a low tower and slender spire, situated half a mile inland of the town, is conspicuous. It is said that at the period this inconvenient position was chosen the sea was making rapid encroachments on the coast; the reverse, however, is now the case in this immediate neighbourhood, a broad sandy flat having gradually formed in front of the cliff. A suburb, with a handsome spire-church (St. John's) and several terraces fronting the sea, has been formed of late years on the south side of the harbour.

The imports consist of wood, coal, linseed, and general goods, besides which cattle, sheep, &c., are annually imported from the Continent. The exports are fish, corn, malt, &c. On the 1st January 1881, the registered shipping of the port was 444 vessels of 17,961 tons; and the arrivals in 1886, 679 vessels of 92,630 tons. Population, 20,470 in 1881.

**Supplies.**—Coal in small quantities can be obtained, and vessels coaled in the harbour. Wooden vessels may be readily repaired; ordinary supplies are plentiful.

**LIGHTS.**—Lowestoft has been an important light-station from the beginning of the seventeenth century. The high lighthouse, built in 1609 and rebuilt in 1676, on the brink of the cliff at the north end of the town, is partly hidden by trees; from it is exhibited a *revolving white light*, at intervals of *thirty seconds*, at an elevation of 123 feet above the level of high-water; a *fixed red light*, visible between the bearings S.W.  $\frac{1}{4}$  S. and S.S.W.  $\frac{3}{4}$  W., is shown 24 feet below the *white light*. The low lighthouse, consisting of a lantern supported on an iron framework, stands on the beach at the ness S. 23° E., 830 yards from the high lighthouse; the light



Lowestoft High Lighthouse,

shown from it is an *occulting* light, that is to say, once in *every half minute* it suddenly disappears for *three seconds*, and then, as suddenly, re-appears at full power ; it shows *red* seaward between the bearings S.S.W. and N.N.E.  $\frac{3}{4}$  E., and *white* inshore of those bearings, and is 40 feet above high-water. Both structures are painted white, and the lights may be seen in clear weather at the respective distances of 17 and 11 miles.

**CAUTION.**—As the western limit of the *red arc* of Lowestoft low light leads rather close to the beach it is necessary, when approaching Lowestoft ness from the southward with the *white light* in sight, to enter the *red light* before getting abreast of Lowestoft pier.

**Telegraph Cable Beacons.**—Two beacons on Lowestoft point mark the line of the sub-marine cable, connecting England and Holland.

**Fog Signal.**—In thick or foggy weather, a bell is sounded from the low lighthouse *three* times in quick succession *every quarter-minute*.

Vessels from across the North sea generally prefer making the land about Lowestoft, as the soundings are regular, the offing is clear of out-lying dangers, and the high land by day and the lights by night render it easily distinguishable.

**Harbour.**—Lowestoft harbour, an entirely artificial work, was originally intended to effect a direct communication between Norwich and the sea ; lake Lothing, a tributary of the Waveney, with a surface extent of 1,300 acres, which approached within 400 yards of the sea, having been connected with the latter by a cut which was made in 1830, and fitted with piers, gates, and sluices ; a channel was also dredged through lake Lothing up to Mutford bridge. These works were completed in 1832, at an expense of 150,000*l.*, one-third of which sum was obtained from the Exchequer Loan Commissioners.

The harbour was used for several years, but owing to the admission and retention of sea water in lake Lothing, it gradually diminished in depth from deposit ; the sluice gates were rendered useless by the ravages of the sea worm (*teredo navalis*), the quays and embankments fell in masses and were washed away, and the entrance to the harbour became blocked up by a bar of shingle and sand. In 1841, the revenue of the port not being sufficient to meet the current expenses, it was taken possession of and sold by the Exchequer Loan Com-



missioners, and after passing through several hands, it ultimately became the property of the Great Eastern Railway Company.

In 1845, while in possession of Sir Samuel Peto, the old works, with the exception of the sluice gates, were repaired, and a new harbour on a large scale was constructed outside of, and in continuation of, the old one. It consists of two piers of open piling filled in with stones, which project into the South road, and enclose a space of 18 acres; the entrance is 150 feet wide, and faces south-east. Owing to the close nature of the harbour, it is subject to the deposit of matter brought in by the sea from the moveable sands in its vicinity; but a channel from the sea to the inner harbour, with 10 feet in it at low water, is generally maintained by dredging. Latterly, 1885, a fish harbour, 10 acres in extent, has been dredged out on the north-east side of the old harbour.

There is a dry dock, 224 feet in length, with 46 feet width of entrance, and 12 feet over the sill, which has received a steamer of 1,119 tons; and also a patent slip, capable of taking up a vessel of 200 tons. The Great Eastern Railway Company has saw mills on the north wharf, above the bridge.

There are two fish markets on the north side of the outer harbour, and there is a sailors' home and a hospital in the town.

**LIGHTS.**—Each pier-head of the outer harbour is marked by a lighthouse, from which a *fixed red* light is shown all night (that on the north pier is obscured in-shore of the bearings S.W. by W.  $\frac{1}{4}$  W.) and a fixed *green* light from the extension works at the north end. A *red* light is also shown at the look-out at the fish market when there are 10 feet at the entrance of the harbour, and a *green* light when there are less than 10 feet. Two *green* lights are also shown at the entrance of the inner harbour. When the navigation is obstructed, a *red* light is shown from the centre of the bridge by night, and a *red* flag by day from the lock-wall. A *green* light is shown from the centre of the bridge when it is closed, and a bright light from the lock-wall when the bridge is open and the navigation is clear. No vessel is to approach until this *bright* light is shown.

**Signals.**—The depth of water between the outer pier-heads varies to such an extent that the following signals have been established.

**By day.**—A *red* flag will be hoisted at the old fish market look-out when the depth at the entrance of the harbour is 10 feet and upwards; and a *black* ball when there is less than 10 feet.

**By night.**—A *red* light on the look-out will indicate a depth of 10 feet or more, and a *green* light when there is less than 10 feet at the entrance.

The harbour service is conducted by a body of pilots, and steam tugs are commonly employed, their charge being according to a regulated scale of prices. Vessels bound into the harbour and requiring a steam tug should hoist a flag or burgee at the masthead by day, and two lights where best seen by night. A single light is the night signal for a pilot. A dredger, for which vessels should look out, is often at work in the entrance.

**CAUTION.**—After a succession of easterly gales sometimes a sand bar is formed at the entrance of Lowestoft harbour, which almost dries at low-water. It is dredged away as soon as practicable.

**A Life-Boat**, and also rockets and mines, are maintained here.

In the vicinity of Lowestoft harbour the land is low, but cliff begins again half a mile beyond it, and Kirkley church stands prominently a short distance back.

**PAKEFIELD.**—The fishing village of Pakefield is on the brink of the cliff one mile to the southward of Lowestoft harbour, several villas adjoining it to the northward ; its church and windmill are the principal objects, but, from standing on lower ground than the village, they are not very prominent.

**Life-Boats.**—Two life-boats are stationed at Pakefield.

Pakefield lighthouse, built in 1832 for leading through Pakefield gateway, is one mile to the south-west of the village at the head of a deep score in the cliff named Wilkinson's hole. Being only 33 feet high, it is not a plain object from the sea, but there is more wood about it than elsewhere in the neighbourhood, and its position may be recognised by this feature. On account of the changes which have occurred in Pakefield gateway, the light from this building was superseded by one at Kessingland fish-houses, but this channel has again closed up, and the light is now (1887) exhibited from Pakefield cliff.



Pakefield disused lighthouse.

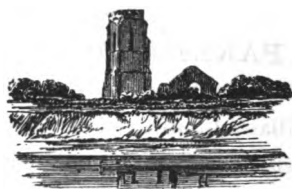
**PAKEFIELD LIGHT.**—A fixed *red* light is exhibited from a hut on the cliff 660 yards in a southerly direction from Pakefield

church. The light, 30 feet above high-water, is visible 10 miles between the bearings of W. by N.  $\frac{1}{2}$  N. and N.W.  $\frac{1}{2}$  W., embracing the space between the East Newcome and the New Pakefield gateway buoys, thus marking the channel across the Newcome sand, the least depth in which at low-water in 1886 was 12 feet.

**KESSINGLAND.**—The cliff continues of a nearly uniform height from Kirkley to Kessingland fish-houses, a cluster of red-tiled cottages near the beach. The village of Kessingland, three quarters of a mile back from the cliff, has much wood about it; its church, one of the principal objects on the coast, is a plain building with a lofty square tower, its size showing that Kessingland was formerly a place of more importance than it is at present.

**Life-Boats.**—Three life-boats, and a rocket apparatus, are stationed at Kessingland.

**COVEHITHE-NESS.**—A shingle beach succeeds the cliff at Kessingland fish-houses, and, at the distance of nearly 2 miles, forms the low point Covehithe-ness. The background in this district is slightly undulated and well wooded, with no remarkable objects, but a thick compact grove stands close to the beach at Covehithe-ness, by which it may be readily known. Covehithe church (tower), with its ivy-covered ruined chancel, is prominent a short distance in the rear. Off Covehithe-ness is a *conical black* buoy, marking the edge of the shoal water forming the western boundary of Covehithe channel.\*



Covehithe church.  
N.W. by W., 1 mile.

**A Rocket** apparatus is stationed at Covehithe.

Low cliff extends for one mile from Covehithe-ness to Easton broad or lake, which has a wooded margin; thence succeeds Easton-ness, a low cliff. The sea has made great ravages here, for according to tradition, the easternmost point of England and the city of Easton Bavent formerly occupied a site abreast, which is now two miles from the land.

Beyond Easton-ness a low shingle beach extends to Southwold.

## LOWESTOFT SANDS AND ROADS.

Shoals, in continuation of those abreast Yarmouth, lie off the whole of the coast just described.

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For position of buoys, see the end of this Chapter, p. 257.

**HOLM SAND** is separated from Corton sand by Corton gateway and commences as a narrow spit projecting into Corton road, about one mile and a half from Corton church ; from this spit the inner or western side of the sand trends in a S. by W. direction for 4 miles to its south-western extremity. Across the body of the sand the breadth is one mile, but it gradually becomes very narrow to the south-westward. It is shoal and steep-to throughout, and has two small patches which dry at low-water. Between the Holm and Lowestoft ness is Lowestoft North-road.

The Holm sand is marked by five *can red* and *white* buoys on the west side, by two *conical black* buoys on the east side, and by a *spherical* buoy with *staff* and *St. Andrew's cross* painted *red* and *white* at its south extremity.\*

The Holm sand forms the north-eastern boundary of the Stanford channel.

**NEWCOME SAND**, within the south-west part of the Holm, begins south-east of Lowestoft-ness, and joins the Barnard shoal off Covehithe-ness, forming the south-eastern defence of Lowestoft South road, and Pakefield road, and the north-western boundary of the Stanford channel. The shoal is about  $4\frac{1}{2}$  miles long and one mile broad ; the general depths over it are from 7 to 13 feet, but there is as little as 5 feet over one portion of it. Over one part of the Newcome shoal is a swatchway abreast Pakefield, the least water in which is 12 feet. This is named Pakefield gat, and is very useful to fishing boats and vessels of light draught bound to Lowestoft.

The Newcome shoal is marked by a *spherical* buoy painted *red* and *white* in *horizontal* bands, and with *staff* and *diamond* at its north end ; by 5 *can* and one *spherical black* and *white* buoys on its west side, and by four *conical* buoys on its east side, two of which are painted *red* and two *black*. One of the *black conical* buoys is surmounted by a *staff* and *ball*, and serves, with the *spherical* buoy on the *west* side of the Newcome, to mark the south limit of the Pakefield gat.\*

**BARNARD.**—This shoal, a continuation of the Newcome to the south-westward, extends from abreast Covehithe-ness one mile and a half in a N.E. by N. direction, leaving a narrow swatchway between it and the shore ; 6 feet upon the north-east part of it is S.E.  $\frac{3}{4}$  S., one mile from Kessingland fish-houses. The breadth of the shoal

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\* For position of these buoys, see the end of this Chapter, pages 254 and 255.

averages one-third of a mile, and the depths upon it are from 2 to 11 feet.

The Barnard is marked by three *conical black* buoys on its south-east side, by two *can black and white* buoys on its west side, and by a *black and white spherical* buoy with *staff and diamond* at its south-west extreme.\*

**Telegraph Cables.**—A telegraph cable from Lowestoft-ness to Nordeney extends from a short distance north-east of the low light-house in an E.N.E. direction across the North road, passing  $3\frac{1}{2}$  cables to the southward of Holm End buoy; another cable lies from the same point E.  $\frac{1}{4}$  N. to about midway across the road, and then bends across the Holm sand; and a third cable to Zandvoort is laid in a south-east direction from the ness.

**LOWESTOFT ROADS** afford better anchorage than Yarmouth road, in consequence of the greater protection they receive from their covering or outlying sands, but the space is confined. In Corton road the bottom consists of mud cars, blue clay, and mud; in Lowestoft North road, of blue clay and mud; in the South road, of mud and ooze; and in Pakefield road, of blue clay and mud. The best position in easterly gales is, as previously remarked, either in North Lowestoft road under Holm sand, or in Gorleston road under the South Scroby; during north-westerly gales in Lowestoft South road; and in the south-westerly gales in the North road; moreover, by anchoring south of Yarmouth haven, vessels will be clear of the traffic through Hewett channel towards Cockle gateway and *vice versa*.

**DIRECTIONS.**—In proceeding from Yarmouth to Lowestoft roads there are no obstructions in the way; the shore is clean throughout, and the inner side of Corton and Holm sands is clearly marked by the buoys. From Lowestoft North road there are two passages to the southward to the open sea, the outer being Stanford channel, and the inner one through Lowestoft South road and Pakefield gateway.

**DIRECTIONS for Stanford Channel.**—Stanford channel,† between the south-west part of the Holm and the Newcome, opened out, in 1842, to the eastward of the position of a former channel of the same name, but since then it has gradually become narrower. Formerly it was available as a night passage, but the light-vessel that was used for the purpose was removed several years ago. In

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\* For positions of these buoys, see the end of this Chapter, p. 256.

† **Caution.**—See footnote, page 223.

September, 1885, the depth had increased to 26 feet at low-water. It is marked by *red conical* buoys on the west side (the Newcome buoys), and by *red and white can* buoys on the east side (the Holm buoys).

No leading mark can be given for it ; proceed with the *horizontally striped red and white* buoy with diamond, and *red* buoys of the Newcome to the westward, and the *red and white chequered* buoys of the Holm to the eastward, until past the *spherical* buoy at the South end of the Holm sand, and, when an offing of from one to two miles has been obtained, a S.W. by S. course for 20 miles will lead outside Sizewell bank, inside Aldborough Napes, and to a fair berth abreast Orfordness.

The tidal streams set rapidly but fairly through Stanford channel. In strong easterly winds, a vessel bound to the southward can pass out by Stanford channel, and have an offing when through.

**Rounding Lowestoft Ness by night.**—The northern edge of the *red* light from Lowestoft low lighthouse, bearing S.S.W., clears the north-west extremity of Holm sand ; and the southern edge of the *red* light from the same lighthouse, bearing N.N.E.  $\frac{3}{4}$  E., clears the north-west side of the Newcome.

Approaching Lowestoft ness from the direction of Yarmouth, and having passed the village of Corton, on opening the *red* light showing below Lowestoft high light, keep more southerly to open the *red* light from Lowestoft low lighthouse, and continue so until the *red* light on the north pier of Lowestoft harbour is seen, bearing S.W. by W.  $\frac{1}{4}$  W. The latter light kept in sight and closed till Lowestoft low light changes from *red* to *white* will lead round the ness and towards Lowestoft South road.

**DIRECTIONS for Pakefield Gatway.**—Pakefield gatway, the shallow passage across the Newcome, has varied greatly of late years, only 13 feet at low-water springs can be depended on;† the available channel is sometimes across the shoal abreast Pakefield and sometimes as far south as Kessingland. It is at present abreast Pakefield, and is marked by a hut lighthouse on the cliff, showing a *red* light, and by the *north-west and west* Newcome buoys on the

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† It has been observed that heavy southerly gales reduce the depth of water two or three feet below that shown by the chart in Pakefield and Covehithe channels. See, also, footnote, page 223.

Inner side, and the East Newcome and Pakefield gat *conical buoys* on the Outside. It is often used in scant westerly winds by vessels proceeding both southward and northward.

Pakefield church bearing N.W.  $\frac{1}{2}$  W., or the lighthouse hut bearing W.N.W., is the day-mark for leading through it. In working, keep the light-hut between the bearings N.W.  $\frac{1}{2}$  W. and W. by N.  $\frac{1}{4}$  N. The *black* and *white* buoys on the inner side of the Newcome clearly point out the south-eastern boundary of the channel to Lowestoft. The shore, as well as the Newcome, may be approached by the lead in working, but the latter is steep.

**By night**, the present leading mark through the gateway is Pakefield light bearing W.N.W.; if working, tack before the light becomes obscured upon a N.W.  $\frac{1}{2}$  W. or W. by N.  $\frac{1}{8}$  N. bearing; and when the water deepens to 4 fathoms, the gateway will have been cleared; in closing Lowestoft keep within the bright gleam from Lowestoft low lighthouse so as to avoid the Newcome. Passing through the gateway with south-easterly winds do not stand too far over towards the shore before edging away to the northward.

In proceeding out through Pakefield gateway by night, Pakefield light must be kept bearing W.N.W. until a 2 miles offing has been obtained, when a S.W. by S. course for 20 miles will lead outside Sizewell bank, inside Aldborough Napes, and to a fair berth abreast Orfordness.

The Barnard is steep-to on the outside; therefore, while working abreast, go no nearer than into a depth of 10 fathoms, and at night keep Lowestoft high light in sight.

The south-west tail of the Barnard is to be cleared by keeping the tower of Southwold church over the south-west end of Easton cliff, bearing S.W. by W  $\frac{1}{4}$  W.

**CAUTION.**—In working near the Barnard, it must be borne in mind that the ebb stream sets within and strongly upon the south-west tail of the shoal.

**COVEHITHE CHANNEL.**—The alongshore passage, having its outlet between the south-west tail of the Barnard and Covehithe ness, marked by the West, and S.W. Barnard, and Covehithe, buoys, had, in August, 1887, a depth of only 10 feet; it is frequently used by small vessels in off-shore winds, but as the depth in it varies

occasionally,\* and it is also very narrow, it is only available for vessels of very light draught.

**TIDES.**—It is high-water, full and change, at Lowestoft, at 9h. 57m.; springs rise  $6\frac{1}{2}$  feet, neaps  $5\frac{1}{4}$  feet, and neaps range 4 feet. In the offing abreast Lowestoft, the flood stream during springs continues to run S.S.W. until High-water at Dover.

**SOUTHWOLD** is seated on a hill of moderate height, which is nearly surrounded at high-water by the river Blyth, Buss creek, and the sea; the town is neatly built, and the houses facing seaward are of a superior description. The church, the principal object, built in 1460, and in excellent preservation, stands on the north side of the town; its size (the tower being 100 feet high) and commanding height render it one of the most striking objects on the coast. A black windmill on the common to the westward of the town is also a plain object. In the low cliffs in front the bones of the mastodon have been found.

Southwold rose on the decay of the neighbouring city of Dunwich, but it was nearly entirely destroyed by fire in 1659. The celebrated naval battle, known as Solebay sea-fight, was fought in front of it, and towards Dunwich, by the English and Dutch fleets in 1672.

**LIGHT.**—An *occulting* light showing *two occultations* in quick succession, every *twenty seconds*, is exhibited from a lighthouse at the south end of Southwold. To the northward it shows *red* from the bearing of S.W. by W. westerly to the land, and to the southward *red* from the bearing N. by E.  $\frac{1}{2}$  E. easterly to the land; the former bearing leads two cables eastward of the South Barnard buoy, and the latter two cables eastward of Sizewall Bank buoy. In all other directions it shows *white*.

The approximate position of the lighthouse is—Latitude,  $52^{\circ} 19' N$ . Longitude,  $1^{\circ} 40\frac{1}{2}' E$ .†

**Harbour Lights.**—Three *fixed white* lights are shown all night from gas-posts placed 100 yards apart, and at 40 feet above high-water, on the cliff at Southwold; they may be seen at the distance of 9 miles in clear weather.

**Harbour.**—The Blyth, which flows by Laxfield, Halesworth, and

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\* It has been observed that heavy southerly gales reduce the depth of water two or three feet below that shown by the chart in Pakefield and Covehithe channels. See also, footnote, page 223.

† The light is now (1888) shown from a temporary structure, pending the completion of the permanent lighthouse.



Blythburgh, and has its outlet half a mile to the southward of Southwold, constitutes its harbour. In the middle of the eleventh century, the Blyth discharged its waters at Dunwich, and formed a haven of the first maritime importance ; but subsequent to the decay of that ancient city, the haven, owing to the movement of shingle and other causes, became choked from time to time, the river in each case forcing its way to the sea farther from Dunwich, and the present outlet was formed in 1590 by a cut made through the beach in continuation of the lower reach of the river.

In 1747, an Act was obtained for the improvement of the haven, under which the north pier was built in 1749, and a south pier in 1752 ; both have been since either rebuilt or extended. The length of the north pier is 367 feet, and that of the south pier 369 feet; they are built of wood, and are nearly parallel to each other ; the entrance between them is 115 feet in width, and it faces S.E. Within the piers the river has an increased breadth and depth for some distance, then it becomes tortuous and narrow ; it is crossed by the first bridge at Buss creek, about one mile above the outlet. The evils under which the port laboured were not altogether removed by the erection of the piers ; it still became choked on several occasions, even as late as 1839, when it was twice dug out ; but since that period, by the application of steam dredging, and the removal of various obstructions, it has maintained a more permanent character.

**Bar.**—The bar, like the beach on either side of it, is composed chiefly of shingle, with a small proportion of sand, and its position and extent vary according to the prevailing wind ; north-easterly winds having the effect of increasing it, those from the opposite direction reduce it ; but in still weather the deep water track is generally in a south-easterly direction, straight out from between the piers. The height of the bar likewise fluctuates ; sometimes it dries, and again there are several feet over it; but the average depth upon it at low-water springs may be assumed as  $1\frac{1}{2}$  feet.

The maximum draught of the vessels using the port is 9 feet. They load and discharge at Walberswick and Blackshore quay, one-quarter and three-quarters of a mile, respectively, within the entrance. The cargoes for inland are discharged into river craft, and conveyed by them to Halesworth, 9 miles from the sea, and the principal corn market in the locality.

Population, 2,111 in 1881. In 1882 only 26 vessels entered the port.

**Supplies** of every description are plentiful.

**Life-Boats.**—Southwold is a coast-guard station, and it maintains two life-boats, together with the usual apparatus for communicating with stranded vessels.

**Pilots.**—There are six harbour pilots, who attend when vessels are entering or are expected. The harbour may be taken in moderate weather when there is a sufficient depth over the bar, but it is dangerous to attempt it with the wind and sea directly on.

**TIDES.**—It is high-water, full and change at the bar, at 10h. 20m. Ordinary springs rise  $6\frac{1}{2}$  feet, and neaps  $4\frac{1}{2}$  feet, over the river generally. The flow ceases at Bulchamp lock at the mouth of Halesworth navigation,  $6\frac{3}{4}$  miles from the sea, at which limit, the time of high-water is 50 minutes later than at the bar. The tide reaches to a level throughout. Particular winds, especially those from north-west, have the effect of raising the tides here as at the neighbouring ports. It is to be noticed that from here the tidal wave begins again to increase in size, the nearer the estuary of the Thames is approached. The tidal stream outside depends on the times of high and low water at Dover and not on the time of local high water.

**Anchorage.**—The shore abreast Southwold is clean, and there is good riding, in off-shore winds, one mile from the main, in from 7 to 9 fathoms, sand.\*

**The COAST.**—From Southwold, shingle beach prevails for three miles to the south-westward; the village of Walberswick with its tower church stands a short distance within it, and the background is low and partially wooded.

**DUNWICH.**—Dunwich cliff, 50 feet high, ascends abruptly at the termination of the shingle beach to the south-west of Southwold, and continues for  $1\frac{3}{4}$  mile to Minsmere head. At one-quarter of a mile from its northern extremity stands the picturesque ruin of the church of All Saints, consisting of the tower and portions of the walls of the nave and chancel. This is nearly all that remains of the former capital of East Anglia, which was the seat of a bishop in the seventh century, and at one time contained six parishes and fifty religious foundations, besides possessing a haven and numerous ships of war. The sea had made considerable encroachments upon the city at a period antecedent to the conquest, but the greatest destruction occurred between the thirteenth and seventeenth centuries, when streets, churches, and religious buildings fell in succession; in 1565

\* See Admiralty chart. Pakefield gat to Orfordness, No. 102; scale, mile = 1.5 inch.

not a quarter of the city remained, and that portion of it has long since disappeared.

**A Life-Boat** is stationed at Dunwich, also rocket apparatus.

**A Telegraph Cable** extends from near the coast-guard station at Minsmere to Zandvoort, the line of the cable is marked by a large buoy moored in 10 fathoms with Dunwich church, N.W.  $\frac{1}{2}$  W.,  $3\frac{3}{4}$  miles.

**Rockets** for effecting communication with stranded vessels are kept at Minsmere.

**THORPENESS.**—A coast-guard flagstaff stands upon Minsmere head, and a little within it there is a row of coast-guard houses; for 2 miles beyond, the coast consists of a low beach, with a few small windmills behind it; it then changes to a grassy bank with Sizewell coast-guard houses upon it, increasing in elevation to Thorpeness, which is about 40 feet high, and has several houses about it. Southward of the ness, the bank gradually declines in height, and beach succeeds to Aldeburgh. The shore abreast Thorpeness is rocky and foul from the cropping out of crag.

**A Life-Boat** is stationed at Thorpeness, and rocket apparatus is kept there, and at Sizewell gap one mile to the northward.

**DUNWICH BANK** though formerly a separate shoal, may now, for all practical purposes, be considered as the north-eastern extremity of Sizewell bank. Lying nearly parallel to the shore, it is about  $1\frac{1}{2}$  mile long and one-quarter mile broad, and 22 feet upon the centre of it is E. by S., southerly,  $1\frac{1}{2}$  mile from Dunwich church; the depth increasing gradually upon its south-west, north-west, and north-east sides. To clear the bank to the eastward, keep Covehithe church on with the north-east end of Easton cliff, bearing N.N.E., or keep Reydon church tower over the piers of Southwold harbour N.  $\frac{1}{4}$  W.

**SIZEWELL BANK** projects out from Thorpeness E.N.E. for nearly 2 miles, and then slightly bending to the northward, it extends N.N.E.  $\frac{1}{2}$  E. for 4 miles, and nearly joins Dunwich bank. The least water upon it (7 feet) is N.E. by E.  $\frac{1}{2}$  E.  $1\frac{1}{4}$  mile from Thorpeness life-boat house, from whence it gradually deepens to 24 feet at its north-east termination; but towards Thorpeness the bank is broken up into several irregular patches, between which the flood stream sets out strongly; 8 and 9 fathoms occur within one mile

of the bank on the outside. It is marked on its eastern side by a large conical black buoy, *see* page 257.

As in the case of Dunwich bank, Covehithe church, on with the north-east end of Easton cliff, bearing N.N.E. clears Sizewell bank to the eastward; and it is cleared to the southward by keeping Orford castle, in line with Aldeburgh south mill, S.W. by W. Working in the neighbourhood of the bank at night, do not lose sight of the *white* part of Southwold light or the white part of Orfordness light, or stand into a less depth than 10 fathoms.

The sector of *red* light shown from Orfordness lighthouse between the bearings S.W. southerly to the shore covers Sizewell bank, as does the sector of *red* light from the Southwold lighthouse.

**ALDEBURGH or ALDBOROUGH**, 2 miles to the south-west of Thorpeness, consists of an irregularly built street one mile long, with side lanes, at the foot of a steep bank. A villa at the north-east end of the town, several windmills to the south and west, and the church on the summit of the bank, are the chief objects; the latter, dedicated to St. Peter and St. Paul, is a plain structure of freestone and flint, much disfigured by modern repairs with red brick.

A map of 1559 shows Aldeburgh to have been at that time a place of considerable magnitude, and it also represents the church as more than ten times its present distance from the sea, with broad denes in front of the town, as at Yarmouth. It was then a place of some importance, but during last century, many houses, with the market place and cross, were overthrown by the sea, which here, as elsewhere on this coast, is gradually but surely gaining upon the land.

Aldeburgh is much resorted to by visitors in the summer season for sea-bathing.

A bend of the Alde passing close to the town affords facilities for trade, but as this river has a common outlet with the Ore, 9 miles farther to the south-west in Hollesley bay, the shipping and commerce of Aldeburgh will be found noticed under the head, Orford haven, page 271.

**Anchorage.**—There is good riding in Aldeburgh bay in off-shore winds, with Aldeburgh church bearing from N.W. by N. to N.W. by W., and Orfordness lighthouse, S.W.  $\frac{1}{2}$  W., in 9 or 10 fathoms, sand.

**Signal Station.**—At Aldeburgh is a signal station with which

passing vessels may communicate by means of the International Code. See footnote, page 121..

**A Life-Boat**, rockets, &c., are stationed at Aldeburgh.

Vernal's or Vernon's wood, a flat topped copse or clump, stands on high ground a little inland of Aldeburgh, which, in approaching from the offing, is generally the first feature which shows above the horizon, serving as an excellent guide to distinguish this portion of the coast. Slaughden houses, and a massive Martello tower and battery built in 1806 to contain 100 men, are half a mile to the south-west of Aldeburgh, at the bend of the Alde before alluded to, after which, a low shingle beach extends to Orfordness.

**ALDBOROUGH NAPES**, a narrow ridge in the offing abreast Aldeburgh from the centre of which Aldeburgh church bears N.W. by W.  $\frac{1}{4}$  W.,  $3\frac{1}{4}$  miles, lies north-east and south-west, and is 2 miles long and one quarter of a mile broad; the depth upon it varies from 22 feet to 5 fathoms, both sides are steep-to, the depths in approaching it decreasing rapidly from 12 to 5 fathoms; the bottom fine sand. To the westward there is mud, to the north-eastward and eastward broken shells, and to the southward broken shells and stones. It is marked on its south-eastern side by a *black conical* buoy.\*

Orford castle, open on either side of Orford church twice the apparent breadth of the latter, bearing W. by S.  $\frac{1}{2}$  S., and W.  $\frac{1}{4}$  N., clears Aldborough Napes, passing to the northward and southward; Leiston church, in line with Thorpe life-boat house, N.W., leads to the north-eastward; and Iken church, (the summit of the tower is only just visible above the trees) over the centre of Slaughden houses, N.W. by W., or Vernal's wood over the Italian villa, N.W.  $\frac{3}{4}$  N., leads to the south-westward of it.

Between Sizewell bank and Aldborough Napes the depths are from 9 to 13 fathoms, over mud; the *white* lower light at Orfordness, bearing S.W. by W.  $\frac{1}{2}$  W., leads between the shoals at night; but, in standing towards the Napes, do not bring Orfordness light to the westward of S.W. by W.  $\frac{1}{2}$  W.

**ALDBOROUGH RIDGE**, a small in-shore shoal projecting from near Orfordness in a N.E. by E. direction, is about one mile long, and has 18 feet water over it. This shoal some years ago, was nearly connected with Orfordness by two smaller banks, Nathaniel knoll and the Onion, which still remain as a shallow with

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\* For position see page 257.

4 and 5 fathoms upon them. It is marked on its east side by a *black conical* buoy.\*

Aldeburgh church, bearing N.N.W., or Iken church, in line with Slaughden Martello tower, N.W.  $\frac{3}{4}$  W., clears Aldborough Ridge passing to the north-eastward; and Bawdsey cliff, kept open of Orfordness beach, W.S.W., clears it to the south-eastward. The *red* ray from Orfordness light, S.W. southerly, leads within it, and the subsidiary *white* light shown below the upper light, is shown over the Ridge to assist vessels rounding Orfordness at night.

**DIRECTIONS.**—Bound to the north-eastward from abreast Orfordness and intending to pass outside Aldborough Napes, keep Orfordness lighthouse to the northward of West until Aldeburgh church has been brought to bear N.W.  $\frac{1}{2}$  W., or Iken church appears open to the northward of the houses of Slaughden, bearing N.W. by W., when the coasting course may be shaped; but to pass inside the Napes, keep Bawdsey cliff open of the beach at Orfordness until Aldeburgh church has been brought on a N.N.W.  $\frac{1}{2}$  W. bearing, or Iken church shows open to the northward of Slaughden Martello tower, when a N.E.  $\frac{1}{2}$  N. course will lead inside the Napes, and more than one mile outside the buoy upon Sizewell bank. At night do not open the subsidiary *white* light at Orfordness until Southwold light is West of North.

**TIDES.**—It is high-water, full and change, at Orfordness at 11h. 15m.; springs rise 8 feet, neaps  $6\frac{1}{2}$  feet, and neaps range 5 feet. Abreast Orfordness the flood stream sets W.S.W., and the ebb E.N.E., the former continuing until the time of high-water in Harwich harbour.

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\* For position see page 257.

## CROMER TO ORFORDNESS.

## POSITIONS OF BUOYS.

## HAISBOROUGH SAND BUOYS.

**BUOYS.**—The following are the buoys marking the Haisborough Sand :—

**North Haisborough**, *spherical, black and white, in horizontal bands*, lies in 7 fathoms ; with Haisborough light-vessel, W.  $\frac{3}{4}$  N.,  $1\frac{1}{4}$  mile ; North Middle Haisborough buoy, S.  $\frac{1}{2}$  E.,  $2\frac{1}{3}$  miles.

**North Middle Haisborough**, a *can, chequered black and white*, lies in  $14\frac{1}{2}$  fathoms ; with Haisborough light-vessel, N.N.W.  $\frac{2}{3}$  W., distant  $2\frac{9}{10}$  miles ; North Haisborough buoy, N.  $\frac{1}{2}$  W.,  $2\frac{1}{3}$  miles.

**Middle Haisborough**, *can, black and white, vertical stripes, with staff and cage*, lies in 13 fathoms ; with Edingthorpe and Bacton churches in line, bearing W.  $\frac{1}{4}$  S. ; and North Haisborough light-vessel, N.N.W.  $\frac{1}{2}$  W., distant  $6\frac{1}{10}$  miles.

**South Middle Haisborough**, *can, chequered black and white*, lies in 10 fathoms ; with East Ruston mill in line with Happisburgh lighthouse, bearing W.  $\frac{1}{2}$  S. ; and Middle Haisborough buoy, N.W. by N.,  $2\frac{3}{4}$  miles.

**S.W. Haisborough**, a *can buoy, black and white, vertically striped* lies in 11 fathoms on the south-west side of the sand ; with Waxham church tower twice its length northward of Hickling church, W. by S.  $\frac{1}{2}$  S. ; South Middle Haisborough buoy, N.N.W.  $\frac{3}{4}$  W.,  $1\frac{8}{10}$  mile.

**South Haisborough**, a *can buoy, chequered black and white with staff and cage*, lies in 10 fathoms ; with Winterton mill, nearly midway between the lighthouse and look-out, S.W.  $\frac{2}{3}$  W. ; Newarp light-vessel, S.  $\frac{1}{4}$  W., distant  $5\frac{2}{3}$  miles ; and Would light-vessel, W.  $\frac{1}{2}$  S., 2 miles.

**East Haisborough**, a *conical black buoy, with staff and globe*, lies in 15 fathoms on the east side of the sand ; with South Haisborough buoy S.S.E., distant  $6\frac{3}{4}$  miles ; North Haisborough light-vessel, N.W.,  $5\frac{3}{4}$  miles.

## HAMMOND KNOLL BUOYS.

The following buoys mark the Hammond knoll :—

**North Hammond Knoll** is a *conical black* buoy, in 15 fathoms on the east edge of the northern end of the shoal water ; with Martham church in line with Would light-vessel, S.W.  $\frac{3}{4}$  W. (westerly) ; Happisburgh church in line with South Middle Haisborough buoy, W.  $\frac{1}{4}$  S.

**South Hammond Knoll** is a *can* buoy with *black and white vertical stripes*, in 7 fathoms ; with Winterton church, W.S.W. ; Would light-vessel, W. by N., distant  $5\frac{1}{2}$  miles.

## WINTERTON RIDGE BUOYS.

**North Winterton Ridge** is a *conical black* buoy, with *staff and globe and half globe* on top, in 12 fathoms ; with Newarp light-vessel, S.W.  $\frac{3}{4}$  W., distant  $7\frac{3}{10}$  miles ; Would light-vessel, W.  $\frac{3}{4}$  N.,  $7\frac{1}{2}$  miles.

**South Winterton Ridge**, a *spherical* buoy, painted *black and white* in *horizontal stripes*, with *staff and St. George's Cross*, lies in  $4\frac{1}{2}$  fathoms at the south end of the shoal part of the ridge. From it Winterton church appears nearly midway between Winterton lighthouse and Martham church, W.  $\frac{1}{2}$  S. ; Would light-vessel, N.W. by W.  $\frac{1}{2}$  W., 9 miles.

## BUOYS ON THE LEMAN BANK.

**North-west Leman**, a *can* buoy, *chequered black and white*, with *staff and cage*, lies in 7 fathoms 2 miles N.N.W.  $\frac{3}{4}$  W. from the shoal patch on the east side of the shoal, with Leman and Ower light-vessel bearing S.E. by E.  $\frac{1}{3}$  E., distant 6 miles ; north-west Ower buoy N.E. by N.,  $4\frac{1}{3}$  miles.

**South-east Leman**, a *can* buoy, *striped vertically black and white*, lies in  $4\frac{1}{2}$  fathoms, at the south-east end of the Leman, with Leman and Ower light-vessel bearing N. by W.  $\frac{3}{4}$  W., distant  $6\frac{1}{2}$  miles ; North Winterton ridge buoy, S.W.  $\frac{1}{2}$  S., 13 miles.

## BUOYS ON OWER BANK.

The Ower is marked by three buoys, viz :—

**North-west Ower**, *conical*, *black with staff and globe*, in



13 fathoms, with the light-vessel bearing S.S.E. easterly, distant  $7\frac{1}{2}$  miles; and the north-west Leman buoy, S.W. by S.,  $4\frac{1}{2}$  miles.

**South-east Ower** is a *black conical* buoy, in 5 fathoms, with the light-vessel bearing N.W. by W., distant  $2\frac{8}{10}$  miles; south-east Leman buoy, S.  $\frac{1}{4}$  W.,  $4\frac{1}{2}$  miles.

**North-east Ower** is a *black conical* buoy in 12 fathoms on the eastern side of the eastern elbow of the Ower sand. From it the light-vessel bears S.  $\frac{3}{4}$  W. distant  $2\frac{3}{4}$  miles and the N.W. buoy N.W.  $\frac{3}{8}$  N. distant 5 miles.

**Ower Watch Buoy.**—A *can* buoy with *black and white vertical stripes*, is placed on the western edge of the Ower bank to mark the position of the light-vessel. From the buoy the Ower and Leman light-vessel bears S.W. by W.  $\frac{1}{2}$  W., distant 6 cables; and the south-east Owers buoy S.E.  $2\frac{6}{10}$  miles.

#### BUOYS IN YARMOUTH ROADS AND ON BANKS ABREAST.

**WINTERTON NESS BUOY.**—*Conical red*, in 5 fathoms, with Winterton lighthouse just to the southward of a red tiled building, S.S.W.  $\frac{1}{2}$  W.; and Thwart coast-guard hut, W. by N.  $\frac{1}{4}$  N.

**NORTH BANK** is a *black conical* buoy, in  $5\frac{1}{2}$  fathoms, with the westernmost windmill at Southtown in line with the gasometer at Yarmouth N. by W.  $\frac{1}{2}$  W.; Pilot house shut in by north pierhead W. by S.  $\frac{3}{4}$  S.

#### COCKLE SAND BUOYS.

**North Cackle**, *spherical* with *black and white horizontal stripes*, and *staff and diamond*, lies in 8 fathoms; with Winterton church just northward of the coast-guard house, W.  $\frac{3}{4}$  N.; St. Peter's church, Yarmouth, in line with the silk factory chimney, S.S.W., southerly.

**N.E. Cackle**, *black, conical*, in 10 fathoms; with Winterton church just northward of the light-keepers' cottages, bearing N.W. by W.; Nelson monument open of the Houses at Yarmouth, S.S.W. (westerly.)

**S.E. Cackle**, *black, conical*, in  $6\frac{1}{2}$  fathoms; with Hemesby church, midway between Martham church and a mill to the southward, bearing N.W. by W.; St. Nicholas church spire its length westward of the mill on the north denes, S.S.W.  $\frac{2}{3}$  W.

**West Cockle Spit**, *can buoy, red and white vertical stripes*, in 25 feet, at the south-west tail of Cockle sand ; with Martham church in line with a sandy patch in the cliff N.W. by W.  $\frac{1}{4}$  W.; St. Nicholas church, Yarmouth, just open westward of Caister village, S.S.W.

#### CAISTER SHOAL BUOYS.

**North Caister**, *black, conical buoy, with staff and globe*, in 13 fathoms ; with Hemesby church just opening north of Scratby houses N.W.  $\frac{1}{4}$  N.; Caister mill its breadth north of Caister look-out, S.W.  $\frac{3}{4}$  W.

**Caister Elbow**, *black, conical*, in 10 fathoms ; with Southtown high mill its breadth eastward of the mill on Yarmouth north denes, S.W.; Cockle light-vessel, N.N.E.  $\frac{1}{4}$  E.,  $2\frac{1}{10}$  miles.

**Middle Caister**, *black, conical*, in 8 fathoms ; with East Caister church one-third from the look-out towards Caister mill, N.W. by W.  $\frac{1}{2}$  W.; Southtown west mill just eastward of the mill on Yarmouth north denes, S.W.  $\frac{1}{3}$  W.

**South Caister**, *black, conical buoy*, in  $4\frac{1}{2}$  fathoms ; with the water-works column in line with East Caister church, bearing N.N.W.  $\frac{1}{2}$  W.; St. Peter's church and the Roman catholic chapel at Yarmouth in line, S.W.  $\frac{3}{4}$  S.

All the buoys on the East side of the Cockle and Caister shoals are *black and conical*, and mark the western boundary of Cockle gateway and Caister road.

#### SCROBY SHOAL BUOYS.

**North Scroby**, a *can buoy, with black and white vertical stripes*, and *staff and cage*, lies in  $5\frac{1}{2}$  fathoms at low-water ; with Winterton lighthouse its width northward of Winterton church N.W., Gorleston church in line with the coast guard at Yarmouth, S.S.W.  $\frac{3}{4}$  W.

**N.W. Scroby**, *can, chequered black and white*, lies in  $5\frac{1}{2}$  fathoms ; with Martham church one third from a mill towards Hemesby church, N.W.  $\frac{3}{4}$  W.; Caister look-out its length southward of Caister mill, S.W.  $\frac{1}{2}$  W. (westerly.)

**Middle Scroby**, *can, black and white in vertical stripes*, lies in 8 fathoms ; with West Caister church one-third the distance from East Caister church towards a large house to the southward, near the

cliff, bearing West; St. Peter's church its length westward of the highest mill at Yarmouth, S.W. (southerly.)

**West Scroby**, a *chequered black and white can buoy*, lies in  $5\frac{1}{2}$  fathoms; with Caister mill in line with the chancel end of East Caister church, N.W.  $\frac{3}{4}$  W. Southtown high mill its breadth southward of St. Nicholas church tower, S.W. by W.  $\frac{3}{4}$  W.

**Scroby Elbow**, a *chequered black and white bell can buoy*, with *staff and cage*, lies in  $9\frac{1}{2}$  fathoms; with East Caister Church tower half its width northward of the waterworks column, N.N.W.  $\frac{1}{4}$  W., Yarmouth town-hall clock tower in line with the south end of the Aquarium, W.  $\frac{1}{2}$  S.

**S.W. Scroby**, a *vertically striped black and white can buoy*, lies in  $8\frac{1}{4}$  fathoms; with St. Peter's church just opening southward of the southern look-out at Yarmouth, bearing W. by N., northerly; St. Nicholas light-vessel, S.S.W., distant  $1\frac{3}{10}$  miles.

**Scroby South Elbow**, a *can buoy, chequered black and white*, with *staff and cage*, lies in 10 fathoms; with Britannia pier-head N.W. by N., Nelson's monument W.  $\frac{1}{2}$  N.

The last three buoys mark the eastern boundary of Yarmouth road.

**South Scroby Spit**, a *can buoy, striped vertically black and white*, lies in 30 feet; with St. Peter's church in line with Wellington pier-head, Yarmouth, N.W.  $\frac{3}{4}$  N; Hopton old church S.W.  $\frac{3}{4}$  W.

**Scroby Hook**, a *can buoy, chequered black and white*, lies in  $5\frac{1}{2}$  fathoms; with St. Nicholas church tower, Yarmouth, its width westward of the Roman Catholic church tower, N.N.W.  $\frac{1}{3}$  W., Corton church, S.W.  $\frac{3}{4}$  W.

**South Scroby**, a *spherical buoy of large size, striped horizontally black and white, with staff and inverted triangle* lies in  $5\frac{1}{2}$  fathoms; with St. James church Yarmouth its length westward of the westernmost mill at Southtown, N.N.W.  $\frac{2}{3}$  W., Corton church, W. by S.  $\frac{2}{3}$  S.

The last three buoys mark the north-east boundary of Hewett channel.

#### CROSS SAND BUOYS.

**North Cross Sand**, *black conical buoy*, is just outside a patch of 27 feet on North Cross sand. This buoy lies in 12 fathoms, with Hemesby church just on the south side of a large house on the cliff W.  $\frac{1}{4}$  S.; Newarp light-vessel, N.  $\frac{2}{3}$  E., distant 9 cables.

**N.E. Cross Sand**, a *conical* buoy, *black*, with *staff* and *globe*, lies in 17 fathoms; with Winterton lighthouse bearing N.W. by W.  $\frac{3}{4}$  W., westerly; St. Nicholas church, Yarmouth, S.W. by W.  $\frac{3}{4}$  W.

**East Cross Sand**, a *black conical* buoy, lies in 21 fathoms; with Winterton lighthouse bearing N.W.  $\frac{1}{2}$  W.; St. Nicholas church, Yarmouth, W.  $\frac{3}{4}$  S.

**Middle Cross Sand**, *black conical* buoy, surmounted by *staff* and *two globes placed vertically*, is in 18 fathoms; with Hemesby church in line with a cluster of houses on the cliff, bearing N.W.  $\frac{1}{3}$  N.; and the Roman Catholic church, at Yarmouth, in line with the highest mill at Southtown, W.  $\frac{3}{4}$  N.

**South Cross Sand**, *black conical* buoy, lies, in  $13\frac{1}{2}$  fathoms; with St. Nicholas church in line with Britannia pier-head at Yarmouth, bearing N.W.  $\frac{1}{2}$  W.; Corton mill just open south of a wood, S.W. by W.  $\frac{3}{4}$  W.

#### CORTON BUOYS.

**North Corton**, is a *spherical* buoy, *striped horizontally black and white*, with *staff* and *diamond*, in 24 feet; with St. Peter's church tower its breadth eastward of the cupola of Yarmouth town hall N.N.W.  $\frac{2}{3}$  W., entrance of Yarmouth haven, W. by N.; N.W. Corton buoy, S. by W.  $1\frac{4}{10}$  miles.

**N.E. Corton**, is a *black conical* buoy, in  $4\frac{1}{2}$  fathoms; with St. Nicholas church spire, Yarmouth, its length eastward of Yarmouth jetty N.N.W., a small watch-house on the Denes just open northward of north pier head Yarmouth haven, N.W. by W.

**S.E. Corton**, is a *black conical* buoy, in 5 fathoms; with Gorleston church just open east of south pier-head at Yarmouth haven, bearing N.W.  $\frac{3}{4}$  N.; South Corton buoy, S.  $\frac{1}{2}$  E., distant  $1\frac{4}{10}$  miles.

**South Corton**, a *black conical* buoy, lies in  $5\frac{1}{4}$  fathoms; with St. Nicholas church just open eastward of Wellington pier-head, Yarmouth, bearing N. by W.  $\frac{1}{4}$  W.; Corton church tower its length southward of the northernmost houses at Corton, W. by N.  $\frac{1}{2}$  N.

**N.W. Corton**, *chequered red and white can* buoy, lies in  $6\frac{1}{2}$  fathoms; with Gorleston church tower its length eastward of Gorleston south pier lighthouse, bearing N.W.  $\frac{3}{4}$  N., Corton church, S.W.  $\frac{3}{4}$  W.

**S.W. Corton**, a *chequered red and white can* buoy, lies in

7 fathoms ; with Hopton old church its length northward of the new church, bearing N.W. by W.  $\frac{1}{2}$  W. ; Southtown highest mill midway between the old and new gas chimneys, N.  $\frac{3}{4}$  W.

### HOLM SAND BUOYS.

**East Holm** is a *black conical* buoy, with *staff and globe*, in  $8\frac{1}{2}$  fathoms ; with Corton church just open northward of the highest house in Corton village, bearing N.W.  $\frac{3}{4}$  W. ; Lowestoft high lighthouse in line with the northernmost black building on Lowestoft-ness, W.  $\frac{1}{4}$  S.

**Middle Holm** is a *black conical* buoy, in  $6\frac{1}{4}$  fathoms ; with Corton church in line with a large red-tiled house, bearing N.N.W.  $\frac{1}{4}$  W. ; Kirkley mill, its length southward of Lowestoft piers, W.  $\frac{3}{4}$  N.

**South Holm**, a *spherical* buoy, *striped horizontally red and white*, with *staff* and *St. Andrew's cross*, lies in  $6\frac{1}{2}$  fathoms ; with Lowestoft town hall clock tower in line with the north side of the gasometer, N.N.W. ; Pakefield church W.  $\frac{3}{4}$  N. and East Newcome buoy, S.W.  $\frac{1}{2}$  S., distant 5 cables.

On the west and north-west sides of the shoal (beginning from the northward) are—

**North Holm** is a *chequered red and white can* buoy, in 5 fathoms, 2 cables to southward of the end of the spit in Corton road ; with Gorleston church tower N.  $\frac{3}{4}$  W., Lowestoft low lighthouse just touching the east end of the house on Lowestoft north ness S.S.W. (westerly).

**Holm End** is a *red and white vertically striped can*, in 8 fathoms ; with Corton mill its length on the west end of a long black groyne, N.W. ; the east end of Lowestoft harbour extension pier in line with the east end of the sewage works on Lowestoft-ness, S.W.  $\frac{1}{8}$  S.

**N.W. Holm** is a *chequered red and white can* buoy, in  $11\frac{1}{2}$  fathoms ; with Lowestoft church and high lighthouse in one, bearing W. by N. (northerly) ; Kirkley church just open northward of the south pier harbour lighthouse at Lowestoft, W.S.W.

**West Holm** is a *red and white vertically striped can* buoy, in 8 fathoms ; with Lowestoft mill in line with the town-hall clock turret, bearing N.W.  $\frac{1}{4}$  W., St. John's church, in line with the north pier-head lighthouse at Lowestoft, W. by N.  $\frac{1}{4}$  N.

**S.W. Holm** is a *can* buoy, *chequered red and white*, in  $6\frac{3}{4}$  fathoms ; with Lowestoft south pier lighthouse midway between the Cupola and tidal flagstaff, N.W. ; West Holm buoy N.N.E.  $\frac{1}{3}$  E. three-quarters of a mile.

**INNER SHOAL** is in-shore between Lowestoft-ness and the harbour ; the shape of it is irregular and subject to constant change, and the shoal has latterly become broken up, the least depth on it at present being 15 feet.

**Buoy.**—The inner part of Inner shoal is marked by a *black and white chequered can* buoy, in 3 fathoms ; with Lowestoft low light-house bearing N.  $\frac{1}{4}$  E., distant  $3\frac{1}{2}$  cables ; North Newcome spit buoy, E. by N., 7 cables.

### NEWCOME SAND BUOYS.

**North Newcome Spit** is a *red and white horizontally striped spherical* buoy, with *staff and diamond*, in  $5\frac{1}{2}$  fathoms ; with Corton mill just open westward of Corton hall, bearing N. by W.  $\frac{1}{2}$  W. ; Kirkley mill its length open northward of the look-out at the east end of the fish wharf at Lowestoft, W.  $\frac{3}{4}$  S.

**N.E. Newcome** is a *red conical* buoy, in 7 fathoms ; with Pakefield church in line with a black building (red-tiled) next northward of the lifeboat house, bearing W.  $\frac{1}{2}$  S. ; North Newcombe Spit buoy, N. by E.  $\frac{1}{4}$  E., distant 9 cables.

**East Newcome** is a *red conical* buoy, in 6 fathoms, marking the south-western point of the Stanford channel and the north-eastern point of the Pakefield channel ; from it Lowestoft church spire is just open southward of the Wesleyan chapel spire, bearing N. by W  $\frac{3}{4}$  W. ; South Holm buoy, N.E.  $\frac{1}{2}$  N., distant 5 cables.

**Pakefield Gatway** is a *black conical* buoy, with *staff and globe*, in  $5\frac{1}{4}$  fathoms ; with St. Margeret's church, Lowestoft, in line with the tidal flagstaff and look-out N.  $\frac{3}{4}$  W., Kessingland church its length southward of the old coast-guard houses, W. by S.

**S.E. Newcome**, a *black conical* buoy, lies in  $5\frac{1}{4}$  fathoms ; with St. Margaret's church, Lowestoft, nearly its length eastward of St. John's church North (easterly), Kessingland church, W.  $\frac{1}{2}$  N.

**North Newcome** is a *black and white vertically striped can* buoy, in  $4\frac{3}{4}$  fathoms ; with the Wesleyan chapel spire, Lowestoft, in line with North pier head lighthouse North ; St. John's church just on with the south side of the Royal Hotel, N.N.W.  $\frac{3}{4}$  W.

**N.W. Newcome** is a *can* buoy, *black and white chequered*, with *staff and cage*, in 5 fathoms ; marking the north-western point of the Pakefield channel, lies, with Christchurch, Lowestoft, in line with the

South pier head lighthouse, N.N.E., Pakefield church in line with a small building, N.W. by W.  $\frac{1}{4}$  W., westerly.

**West Newcome** is a *spherical* buoy, *black* and *white horizontal stripes*, in 5 fathoms ; with Pakefield lighthouse bearing N.W.  $\frac{1}{4}$  N.; and Pakefield mill touching the south side of Pakefield barn, N.N.W.  $\frac{3}{4}$  W. Kessingland church S.W.  $\frac{3}{4}$  W.

**S.W. Newcome** is a *black* and *white chequered* can buoy, in  $3\frac{3}{4}$  fathoms ; with West Newcome buoy, N. by E.  $\frac{3}{4}$  E., distant 7 cables ; South Newcome buoy S. by W.  $\frac{3}{4}$  W., 7 cables. Pakefield church N.  $\frac{1}{4}$  W., and Kessingland church W. by S.  $\frac{3}{4}$  S.

**South Newcome**, a *black* and *white vertically striped* can buoy, in 3 fathoms, lies with Pakefield mill bearing North ; Kessingland church, W.  $\frac{3}{4}$  N., distant  $1\frac{1}{10}$  mile.

#### BUOYS ON BARNARD SHOAL.

**East Barnard** is a *black conical* buoy, in  $5\frac{1}{2}$  fathoms ; with Lowestoft mill its length open eastward of St. John's church, bearing N.  $\frac{3}{4}$  E. ; Kessingland church in line with the southernmost of two white houses on the southern part of Kessingland cliff, N.W.  $\frac{3}{4}$  W.

**S.E. Barnard** is a *black conical* buoy, in 6 fathoms ; with Kessingland church in line with the southernmost of three houses between Kessingland fish-houses and Sea Row, bearing N.N.W.  $\frac{3}{4}$  W. ; Covehithe church open southward of Benacre wood, W.  $\frac{3}{4}$  S.

**South Barnard** is a *black conical* buoy, in 5 fathoms ; with Kessingland church its length on Benacre sluice, bearing N.  $\frac{3}{4}$  W. ; Covehithe church its length southward of the coast-guard house and flagstaff on Covehithe-ness, W. by N.

**Inner Barnard** is a *black* and *white horizontally striped spherical* buoy, with *staff* and *diamond*, in  $3\frac{1}{2}$  fathoms, at the south-west end of the sand ; with the life-boat house near Covehithe-ness its width eastward of Sea Row cottage, bearing N.N.E., and a remarkable tree showing between Covehithe church tower and the ruin of the chancel, N.W.  $\frac{1}{4}$  N.

The three following buoys define the swatchway within the Barnard :—

**S.W. Barnard** is a *black* and *white vertically striped* can buoy, in 15 feet, with Kessingland lifeboat house open eastward of Covehithe lifeboat house, bearing N. by E.  $\frac{1}{2}$  E. ; Covehithe church, in line with the coastguard hut on Covehithe-ness, W. by N.  $\frac{1}{4}$  N.

**West Barnard** is a *can* buoy, *chequered black and white*, in  $4\frac{1}{2}$  fathoms, at the north point of the Barnard ; with St. Margaret's church, Lowestoft, just open eastward of the northernmost house at Pakefield, bearing N. by E.  $\frac{3}{4}$  E. ; Benacre church, W. by N. ; South Newcome buoy, N.E.  $\frac{3}{4}$  N.

### COVEHITHE NESS BUOY.

**Covehithe** is a *black conical* buoy, in  $3\frac{1}{2}$  fathoms ; with Lowestoft and Kirkley high mills in line, bearing N. by E.  $\frac{3}{4}$  E. ; and S.W. Barnard buoy, S.W., 5 cables.

### SIZEWELL BUOY.

**Sizewell Buoy**, a *black conical* buoy, lies in 7 fathoms, about two-thirds of a mile outside the shoalest spot, with Leiston church in line with a house on the north side of Sizewell gap, bearing W. by N. ; and Thorpeness coast-guard flagstaff, in line with the west end of a remarkable clump of trees, S.W. by W.  $\frac{3}{4}$  W.

### ALDBOROUGH NAPES BUOY.

**Aldborough Napes Buoy** is a *black conical* buoy, with staff and globe, in  $4\frac{3}{4}$  fathoms ; with Iken church in line with the south windmill at Aldeburgh, bearing N.W. by W.  $\frac{1}{2}$  W. ; and the south side of Orford castle touching Orford church, W.  $\frac{1}{2}$  S.

### ALDBOROUGH RIDGE BUOY.

**Aldborough Ridge Buoy** is a *black conical* buoy in 5 fathoms on the south-east side of Aldborough Ridge ; with Orford castle and church in line, W.  $\frac{1}{4}$  S. ; Aldeburgh north mill open to the left of south mill, North.

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## CHAPTER VII.

## THAMES ESTUARY. 1ST PART.

ORFORDNESS TO THE NAZE AND THE SHOALS IN THE  
OUTER PART OF THAMES ESTUARY.

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VARIATION,  $16^{\circ} 20'$  West in 1889.

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The Estuary of the Thames may be considered as commencing on the north side, at Orfordness and, on the south side, at the North Foreland and ending at the Nore. The triangular space enclosed between these three points is much encumbered by banks (many of which dry at low water) between which are the channels leading to the River Thames ; and even outside the line joining Orfordness and the North Foreland are several dangerous shoals, which vessels must pass on either side when bound from Orfordness to the Downs or the English channel. The description of this part of the coast must therefore be taken in sections. The passage and dangers between Orfordness and the Downs being first described, then the coast and dangers between Orfordness and the Naze, which includes Harwich harbour ; afterwards the northern channel through the Thames estuary to the Nore and finally, the southern channels from the North Foreland to the Nore.

The extensive shoals lying in the track from Orfordness to the Downs, or "Over the Kent," as this passage is termed among seamen, are the Inner and Outer Gabbards, Galloper, Four-Mile Knolls and Falls to the eastward, and the Shipwash, Long sand, and Kentish Knock to the westward.\* The shoals on the eastern side of the channel will be first described and then those on the western side. To avoid breaking the continuity of the text the positions of the buoys will be given at the end of the chapter.

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\* See Admiralty chart, England, East Coast, North Foreland to Orfordness, including the Entrance to the Thames, No. 1610 ; scale, mile = 0.5 inch.

**INNER GABBARD**, S.E. by S.,  $15\frac{1}{4}$  miles from Orfordness, extends N.E. by N. and S.W. by S.,  $6\frac{1}{4}$  miles, from the depth of 10 fathoms upon either end, and is nearly one mile broad ; 12 feet (the least depth) prevails over about one mile and a half of the shoal from its centre, and the whole of it is steep-to on both sides. It is marked by three *can* buoys *red and white*, one at each end of the shoal and one in the centre on the west side.\*

**OUTER GABBARD**, 4 miles to the eastward of the Inner Gabbard, is 4 miles long in a general N.N.E.  $\frac{3}{4}$  E. and S.S.W.  $\frac{3}{4}$  W. direction, from 10 fathoms water upon each end, and half a mile wide. On the north part of the shoal ground, a patch with 15 feet at low-water springs lies S.W.  $\frac{1}{4}$  W.,  $1\frac{3}{4}$  miles from the light-vessel. A second shoal of 18 feet exists, which is  $1\frac{1}{2}$  cable in extent in a N.E. and S.W. direction. The south part of this second shoal lies S.W. two miles from the light-vessel ; its north part is separated from the 15-foot patch by a channel of  $1\frac{1}{2}$  cable, in which there is 22 feet. On the south part of Outer Gabbard shoal, a ridge with from 25 to 30 feet, and six cables in extent N.N.E. and S.S.W., exists, the shoalest part, a patch of 22 feet, lies N.N.E. nearly one mile from the south buoy. Between the above northern and southern shoal parts of the Outer Gabbard there is a channel about one cable wide with from 5 to 7 fathoms in it.

This shoal, like the Inner Gabbard, is steep-to, but deeper water surrounds it. In still weather the tide ripple shows plainly over both shoals.

**LIGHT-VESSEL.**—The Outer Gabbard is marked by a light-vessel moored in 16 fathoms about  $7\frac{1}{2}$  cables N.E.  $\frac{3}{4}$  E. from the  $4\frac{3}{4}$  fathoms patch at the northern end of the sand. She exhibits at an elevation of 38 feet a *group flashing white* light, consisting of *four short flashes* in quick succession *every half minute* ; the *four flashes* occupying about *ten seconds*, followed by an *eclipse of twenty seconds*. The light-vessel, painted *red*, with the words *Outer Gabbard* on the side carries an inverted cone at the masthead. From her Orfordness lighthouse bears N.W. by W.  $19\frac{1}{4}$  miles. Position, latitude  $51^{\circ} 59' 50''$  N., and longitude  $2^{\circ} 4' 15''$  E. Visible in clear weather 11 miles.

**Buoys.**—The Outer Gabbard is also marked by two buoys, the northern a *conical red* buoy to the eastward of the  $4\frac{3}{4}$  fathoms patch

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\* For position of buoys, see end of this Chapter, page 289.

at the northern end of the sand ; and the southern an *automatic conical signal buoy* painted *red*, in 12 fathoms south-eastward of the 5 fathoms patch at the southern end of the sand.\*

**GALLOPER**, to the southward of the Gabbards, is, within the contour line of 10 fathoms,  $5\frac{1}{4}$  miles in length, in a N.E. by N. and S.W. by S. direction, by half a mile in breadth ; there is only 2 fathoms over the main body of the shoal, and near the northern end of the shoal portion scarcely one fathom ; it is steep-to, the bottom in the vicinity consists of muddy sand, stones, and gravel. This shoal is marked by a light-vessel on the southern part of the west side by a *spherical* buoy painted *black* and *white* in *horizontal stripes*, and surmounted by *staff* and *diamond* at the north extreme, and by a *black can* watch buoy at the south end.\*

**GALLOPER LIGHT-VESSEL**.—Since 1803 the Galloper has been marked by a light-vessel, moored in 20 fathoms, about one mile N. by W. of its south-west extremity. She exhibits two *fixed white* lights on separate masts, each light being 35 feet above the water, and visible 10 miles off in clear weather. Position of light-vessel, lat.  $51^{\circ} 45' 0''$  N., long.  $1^{\circ} 55' 50''$  E.

**Fog Signal**.—A gong is sounded during thick or foggy weather.

From the light-vessel, the shoalest part of the Galloper bears N.E.  $\frac{1}{4}$  E., distant 3 miles ; Shipwash light-vessel, N. by W.  $\frac{1}{3}$  W., 20 miles ; Long-sand light-vessel, N.W. by W., 10 miles ; Kentish Knock light-vessel, W. by S.  $\frac{1}{4}$  S.,  $10\frac{3}{4}$  miles ; and North Foreland lighthouse, S.W. by W.,  $28\frac{3}{4}$  miles ; North Galloper buoy, N.E.,  $4\frac{1}{2}$  miles ; watch buoy, S.E., three quarters of a mile.

**FOUR-MILE KNOLLS and FALLS**.—Four-Mile Knolls are upon the head or north-east end of the Falls. The North and South Falls may be described as a ridge 30 miles long, and at no part more than one mile broad, beginning 2 miles to the southward of the Galloper, and ending abreast of, and 7 miles outside, Goodwin sand. Four-Mile Knolls, which have 4 fathoms upon them, are the highest portion of the ridge, and bear S.  $\frac{3}{4}$  W., about  $3\frac{1}{2}$  miles from Galloper light-vessel. The North Fall extends N.E. by N., one mile, and S.W. by S.,  $4\frac{1}{2}$  miles from Four-Mile Knolls, with a general depth over it of 7 to 10 fathoms ; there is then a depression in the ridge, with 12 to 13 fathoms over it, in a S.W.  $\frac{1}{2}$  S. direction for  $9\frac{1}{2}$  miles, after which, as the South Fall,

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\* For position of buoys, see the end of this Chapter, page 289, *et seq.*

it holds S.S.W.  $\frac{1}{4}$  W. for 15 miles, and ends outside the Goodwin as before stated. The general depth upon the South Fall is 7 and 8 fathoms, but for a considerable extent near the centre there is only  $4\frac{1}{2}$  or 5 fathoms; from the shoalest spots, North-sand-head light-vessel bears W. by N. and N.W.  $\frac{1}{4}$  W., distant 7 miles.

Depths of 16 to 18 fathoms prevail between the Galloper and the north-east extremity of the Falls, which are for the most part steep-to, there being 22 to 24 fathoms within a short distance of either side.

The Shipwash sand being the eastern boundary of the channel called the Shipway, as well as one of the sands bounding the west side of the channel from Orfordness to the Downs, will be described at page 266.

**LONG SAND**, within or to the westward of the Galloper, is the north-easternmost of extensive chain of sands, which, from abreast the Naze to the Kentish shore, forms the eastern boundary of the Black Deep channel into the Thames. This, the deepest channel, is between the Long and Sunk sands; it is not buoyed. The Long sand is 19 miles in length, and its width increases from one mile at its north-east end to 5 miles at the south-west end, where the Duke of Edinburgh channel separates it from the Girdler and Shingles; the depths are from one to 6 feet over a considerable portion of the shoal, and it dries in several places. The north-east point of the Long sand is marked by a light-vessel and a bell buoy, *black with staff and St. Andrew's cross*.\*

**LIGHT-VESSEL**.—A vessel painted *red*, with the word *Longsand* in white letters on her sides and a *diamond* at the masthead, is moored in 11 fathoms to the north-eastward of the extremity of the Long sand; from her position Gunfleet lighthouse bears W.  $\frac{3}{4}$  N., 12 miles; Sunk light-vessel, N.W., 7 miles; Kentish Knock light-vessel, S. by W.  $\frac{1}{4}$  W.,  $8\frac{1}{4}$  miles; and the Long sand buoy W.  $\frac{1}{4}$  S., 2 miles.

She exhibits at an elevation of 40 feet, a *double flashing white* light every *half minute* in the following manner, a flash of *two seconds* duration, an eclipse of *six seconds*, a flash of *two seconds*, followed by an eclipse of *twenty seconds*, visible in clear weather 11 miles.

**Fog Signal**.—In foggy weather a gong is sounded.

**KENTISH KNOCK**, a dangerous sand bank to the south-eastward of Long sand, is separated from it by a channel called Knock

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\* For position of buoys see the end of this chapter, page 289, *et seq.*

Deep,  $2\frac{1}{2}$  miles wide, and from 9 to 13 fathoms deep. From a depth of 10 feet upon the north-east extremity of the Kentish Knock, Long-sand buoy bears N. by E., distant 5 miles; and North Foreland lighthouse, S.W.  $\frac{3}{4}$  S.,  $20\frac{3}{4}$  miles; from this point the shoal to a depth of 5 fathoms at its other end has a south-west direction for 7 miles, and is 2 miles broad; on fully 4 miles of the body of the sand the depth is less than one fathom, and, at low-water, portions of it are left dry. The shoal shelves gradually to the south-westward, but it is steep-to in other directions. It is marked by *red conical* buoys, surmounted by *staves* and *globes* at its north-east and south-west extremities, and by a *conical red* buoy on its south-east side, as well as by a *light-vessel*.\* There are in addition two watch buoys on this sand, one a *black can* near the light-vessel, and the other a *red nun* near the south-west buoy.

**KENTISH KNOCK LIGHT-VESSEL** was placed in 1840; she lies in 11 fathoms,  $1\frac{3}{4}$  miles to the eastward of the sand, in lat.  $51^{\circ} 39' 30''$  N., long.  $1^{\circ} 40' 40''$  E.; and shows a *white* light which *revolves every minute*, at the height of 38 feet above the water, and may be seen at the distance of 11 miles in clear weather.

**Fog Signal.**—During thick or foggy weather a horn gives *two blasts* in quick succession every *two minutes*.

The vessel carries at her mast-head two balls of unequal size, the smaller one being a short distance above the other. From her, Long-sand light-vessel bears N. by E.  $\frac{1}{4}$  E., distant  $8\frac{1}{4}$  miles; Galloper light-vessel, E. by N.,  $10\frac{3}{4}$  miles; North Foreland lighthouse, S.W., 19 miles; and North Sand head light-vessel, S.S.W.  $\frac{1}{2}$  W.,  $20\frac{1}{2}$  miles.

**DIRECTIONS from Orfordness to the Downs.**—Bound to the Downs and being abreast Orfordness, pass 2 miles outside Shipwash light-vessel; Orfordness lighthouse kept N.N.W.  $\frac{1}{2}$  W., clears the Shipwash. From this position, Long-sand light-vessel bears S. by W.  $\frac{3}{4}$  W., distant  $13\frac{1}{2}$  miles, and Galloper light-vessel, S. by E.,  $18\frac{1}{2}$  miles; but, in shaping a course, allowance should be made for the tidal streams, which run S.W. and N.E., except near the shoals, when they set obliquely across them. The flood stream also during springs run across Long-sand head into Black Deep, veering at the last-quarter more north-westerly, or nearly athwart the sand.

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\* For positions of buoys see page 290.

Working, stand towards the Shipwash into 12 fathoms, and towards Long sand into 10 fathoms; Walton hall open north of the Naze tower, will clear Long-sand-head; then stand off to 16 or 17 fathoms. A gully, one mile wide, and having 22 to 24 fathoms in it, extends from 2 miles within the Inner Gabbard to 4 miles within the Galloper; therefore, by a proper attention to the lead, these dangerous shoals may be easily avoided.

Steering to the eastward or westward in the vicinity of the Galloper, pass either one mile to the southward of the light-vessel, or more than 4 miles northward of it.

Closing the Kentish Knock from northward or southward, do not bring its light-vessel to the southward of S.  $\frac{3}{4}$  W., or to the eastward of N.E.  $\frac{1}{4}$  N., in order to maintain a safe distance from the shoal. The channel between the Kentish Knock and Long-sand is not buoyed, and should only be used under exceptional circumstances. From a position one mile to the eastward of Kentish Knock light-vessel, S.W. by S., or S.S.W., for 22 miles, will lead to the mouth of Gull stream, or outside North-sand-head light-vessel.

**TIDES.**—At Galloper light-vessel is afforded another instance of the rotatory movement of the tidal streams, the streams veering in the direction of the hands of a clock in a similar manner to the stream at the Ower and Leman, Smith's Knoll, &c. The stream all over the estuary of the Thames changes at or about the local times of high and low-water, the time of high-water at full and change being between 11h. 30m. and 12h. 0m. At low-water the ebb stream becomes weak and veering to E. by N. and East, ceases in half an hour. The flood stream begins to run in a S.E. direction, veering to the southward and westward till one hour after low water, when it sets about S.W., and so continues until four hours after low-water. During the next two hours the stream veers to W.S.W., and about high-water to W. by S. and West, with slack water. The first of the ebb stream sets to the N.W., veering round by the north and east, until at one hour after high-water when its direction is N.E.; this continues so till four hours after high-water. During the last two hours of the ebb it changes to E.N.E., then to E. by N., and finally to East.

At Kentish Knock light-vessel the flood stream comes from the north-eastward, and it is high-water, full and change, by the ground,

about 11h. 47m., and low-water at 6 o'clock. About low-water the stream begins to run south-westerly towards the eastern part of Margate sand, and four hours after low-water veers a little westward ; it then runs W.S.W., W. by S., and West, and ceases. The set of the ebb stream begins at N.W., and gradually draws round to North and N.E., when the reverse of the flood stream takes place.

Having described the outer channels from Orfordness to the Downs, we now proceed with the description of the coast, &c., from Orfordness to the Naze.

**ORFORDNESS and LIGHTS.**—Orfordness,\* a low point of shingle, and the north-eastern limit of the well-known anchorage, Hollesley bay, has a lighthouse upon it, to the westward of the ness, erected more than a century ago, 99 feet high. Near it on the beach is a coastguard station.

The lighthouse is painted in *red and white* horizontal bands, and exhibits at an elevation of 91 feet above high-water, an *occulting* light, which disappears for *three seconds* every *forty seconds*. The light shows *red* to the northward from the bearing of S.W. (southerly) to the shore, to cover the Sizewell bank ; and *red* to the southward between the bearings of N.E.  $\frac{1}{4}$  E., and N.E. by E.  $\frac{1}{4}$  E., easterly, or over the channel inside the Whiting bank ; whilst from the bearing of N.E. by E.  $\frac{1}{4}$  E., easterly to the shore, the light is *green*. In all other directions the light is *white*. Visible in clear weather 15 miles.

A subsidiary *white* light is also shown from a window 60 feet below the high light in a N.E. direction, visible over an arc of about 25° to cover the Aldborough ridge and assist vessels in rounding Orfordness. Visible between the bearings S.W. by W. and W. by S.

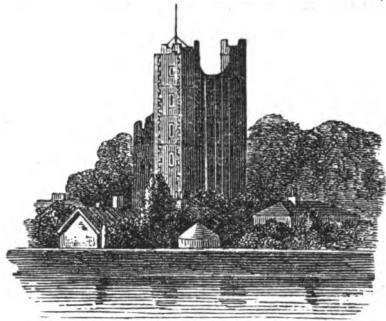
**Rockets** and lines are kept at Orfordness, and also at Orford haven.

**Orford Church and Castle**, standing 2 miles within the light-houses, are among the most striking objects on first sighting the land hereabouts. The former, dedicated to St. Bartholomew, is a very ancient structure, consisting of a nave, side aisles, and tower. Its chancel is in ruin, and the upper part of the tower fell in 1829, and has not since been restored. The castle, of Norman origin, stands

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\* See Admiralty chart of Approaches to Harwich, No. 2,052 ; scale, mile = 1·5 inch ; with plan of Woodbridge haven.

upon a small mound to the westward of the village ; its keep is a polygon of eighteen sides described within a circle of 27 feet radius, and flanked by three square towers placed on the west, north-east, and south-east sides ; the towers are 22 feet wide, and overlook the polygon which is 90 feet high. The walls, 22 feet thick at the base, are immensely strong and in excellent preservation. In consequence of it being an old established sea-mark, Government prevented its demolition by the late Marquis of Hertford in 1805.

Orford castle, W. by N.  $\frac{1}{2}$  N. 1 mile.

**The COAST.**—The shore of Hollesley bay, from Orfordness to Bawdsey cliff, is a low shingle beach, the only marked objects upon which are the Crouch life-boat houses, a cluster of whitewashed cottages at Orford haven named Shingle-street, and five Martello towers between the haven and Bawdsey cliff. Hollesley church is the only prominent object in the well-wooded background.

**Bawdsey Cliff** is of a reddish colour, and bears upon its face numerous marks of land-slips. A large white house among wood, inland and to the northward of the cliff, a windmill at Alderton, and Bawdsey church, with its broad stunted tower, are all plain objects. Bawdsey sea-mark, an obelisk painted *red* and *white* in horizontal bands, stands near the north-east end of the cliff ; in line with Bawdsey church, N. by W., it clears the Roughs on the north-east edge in 27 feet.

Bawdsey church, W.  $\frac{1}{2}$  N., 1 mile.

Bawdsey sea-mark.

**WHITING BANK.**—Opposite the section of coast just noticed, and lying in a direction conforming to it, are several shoals, at 2, 4, and 6 miles in the offing. The innermost of these is the Whiting, which forms the south-east boundary, and the principal defence to Hollesley bay ; from 3 fathoms upon the north-east end of the shoal, Orfordness lighthouse bears N.E.  $\frac{3}{4}$  N., distant  $1\frac{1}{10}$  mile ; from this, curving westerly, it extends S.W. by W. for  $2\frac{1}{2}$  miles to the



same depth at the other end, with a breadth of one-quarter mile about its centre or widest part ; the depths over a large portion of it vary from 9 to 10 feet, while there are 6 to 7 fathoms close to on either side. Dovercourt high light becomes obscured on a W. by S. bearing at the south spit of the Whiting.

**BUOYS.**—The Whiting shoal is marked by a *spherical* buoy, with *staff* and *diamond*, painted in *red* and *white* horizontal bands at its N.E. end ; by a *can* buoy, painted in *red* and *white* vertical stripes at its north-west shoulder, and by a chequered *red* and *white* *can* buoy at its south-west end.\*

**Flagstone and Kettlebottom.**—The Flagstone is a patch of foul ground with  $4\frac{3}{4}$  fathoms over it, a little within the south-west tail of the Whiting ; the Kettlebottom is a small irregular sandy patch of  $2\frac{3}{4}$  and  $3\frac{1}{2}$  fathoms, 2 miles S. by W.  $\frac{3}{4}$  W. from the south-west extremity of the Whiting, and one mile from the north-west side of Bawdsey sand. It lies out of the usual sailing track.

**BAWDSEY BANK**, forming the north-western boundary of the channel named the Shipway, is to the south-eastward of the Whiting. Its north-east extremity, Bawd head, of 5 fathoms, is S.  $\frac{2}{3}$  E.,  $2\frac{4}{10}$  miles from the north-east end of the Whiting, with Orfordness lighthouse, bearing N.  $\frac{7}{8}$  E., distant  $3\frac{1}{2}$  miles ; from thence it extends S.W. by W. for 5 miles, with an irregular breadth of half a mile. The least water upon it, 15 feet, is about 2 miles from Bawd head, with 17 feet towards the south-west end, while a depth of 7 fathoms is close to on either side.

**BUOYS.**—Bawdsey bank is marked by a *black conical* buoy on the south-east side of Bawd head, its north-east extreme ; and by a *spherical* buoy, with *staff* and *two triangles* painted *black* and *white* in *horizontal bands* at its south-west end.†

**SHIPWASH SAND**, the south-eastern boundary of the Shipway channel is the outermost of the dangers previously referred to. Taking the contour line of 5 fathoms as its boundary, it is 8 miles long in a general N.E. by N. and S.W. by S. direction, and a little more than half a mile wide ; from its north-east extremity Orfordness lighthouse bears N. by W.  $\frac{1}{4}$  W.  $4\frac{1}{2}$  miles ; and from its south-west extremity Landguard point light bears N.W. by W.  $9\frac{3}{4}$  miles. In no part is the sand three-quarters of a mile broad, its summit is

\* For positions of buoys, see p. 290.

† For positions of buoys, see the end of this chapter, p. 291.

broken into patches, two of which near the centre of the shoal have as little as one foot upon them ; it is also steep-to on both sides. This sand is marked by a light-vessel at its north-east extremity ; by 3 *can black and white buoys* on its north-west side ; by two *conical black buoys* on its east side, and by a *spherical buoy, with staff and triangle, painted in black and white horizontal stripes* at its south-west extremity.\*

**SHIPWASH LIGHT-VESSEL**, moored in 9 fathoms, N. by W., one-third of a mile from the north-east end of the sand, was placed in 1837 to render the Shipway navigable at night, so as to avoid the round through Hollesley bay. She exhibits at an elevation of 39 feet a *triple flashing white light every half minute* as follows :—A short flash of *one and a half seconds* duration, an eclipse of *four seconds*, a long flash of *five seconds*, an eclipse of *four seconds*, a short flash of *one and a half seconds*, followed by an eclipse of *fourteen seconds* ; the light should be seen in clear weather 11 miles.

**Fog Signal.**—In thick or foggy weather a horn sounds *three* blasts in quick succession every *two minutes* in the following manner : a *low note* of *two seconds* duration, silence *two seconds* ; a *low note* of *two seconds*, silence *two seconds* ; a *high note* *two seconds* followed by an interval of *one hundred and ten seconds*.

From this vessel, Aldeburgh north windmill is its apparent breadth open to the eastward of Aldeburgh south windmill, bearing N. by E. ; and Bawdsey church is a little open to the northward of the second Martello tower (X) to the north-east of Bawdsey cliff, W. by N. ; Orfordness lighthouse, N. by W.  $\frac{1}{4}$  W., distant  $4\frac{1}{10}$  miles ; Aldborough Napes buoy, N.E.  $\frac{3}{4}$  N., 7 miles ; Bawdsey N.E. buoy, W. by N.,  $1\frac{7}{10}$  mile ; Sunk light-vessel, S.W.  $\frac{1}{3}$  S.,  $11\frac{7}{10}$  miles ; and Galloper light-vessel, S. by E.  $\frac{1}{3}$  E., 20 miles.

**CUTLER**, a rocky shoal abreast of, and  $1\frac{1}{2}$  miles from, Bawdsey cliff, is  $1\frac{1}{2}$  mile long, in a general N.E.  $\frac{1}{2}$  N., and S.W.  $\frac{1}{2}$  S. direction, and one-third of a mile wide, the least depth on it, 4 feet, being half a mile from its south-west end. There is a shoal passage between it and the shore. Dovercourt high light becoming obscured on a W. by S. bearing marks the northern edge of this shoal. Off its south-east side shoal water extends for nearly a mile, between which and the south-west end of the Bawdsey bank there is a 6

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\* For position of buoys, see the end of this chapter, p. 291.

fathom channel at low water, named the Sledway. The Cutler is marked at its south end by a *red conical* buoy.\*

**LOWER ROUGH**, one of the shoals to the south-west of the passage named the Sledway, is an irregular rocky shoal  $1\frac{1}{2}$  mile long, North and South, and three-quarters of a mile broad; the shoalest water is 15 feet, but the prevailing depths over it are from  $3\frac{1}{2}$  to  $4\frac{1}{2}$  fathoms; there are 6 and 7 fathoms about it to the north-eastward. It is marked by a *spherical* buoy, painted *red and white in horizontal bands* at its south end.\*

**UPPER ROUGH**, the last of the offing shoals to be noticed here, is another rocky patch, with 16 feet upon it, lying close to the south-westward of the Lower Rough. It is out of the proper track of shipping, and is therefore unbuoyed. Both the upper and lower Roughts may be considered as the shoalest heads of a bank of some extent, the depths on which are from  $3\frac{1}{2}$  to 5 fathoms, which considerably narrows the passage for large ships through the Sledway and Shipway.

The description of the shoals in the progress towards the Thames is continued on page 303, *et seq.*

**The SHIPWAY**, the channel between Bawdsey bank and the Shipwash, is about 2 miles wide, with depths of from 6 to 10 fathoms it it. Both sides of the channel are steep-to.

**DIRECTIONS.**—From one mile outside Aldborough Napes, a S.W. course for 7 miles will lead nearly one mile to the westward of Shipwash light-vessel and to the entrance of the Shipway, whence a S.W.  $\frac{1}{2}$  S. course for 12 miles, will carry through that channel,  $1\frac{1}{4}$  mile outside West rocks, to  $1\frac{3}{4}$  mile outside the Gunfleet, and half a mile within the Sunk light-vessel at the entrance of East Swin. The depths in this track are irregular, varying from 6 to 11 fathoms, the shoalest water being between the south-west end of the Shipwash and the Lower Rough, where, at 2 cables to the eastward of the track, is a patch of 27 feet named the Threshold.

Attention must be paid to the set of the tidal streams, which run fairly through the main channel, but across the shoals W.S.W. and E.N.E. from anywhere in their vicinity.

**At night**, being nearly one mile to the westward of Shipwash

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\* For position of buoys, *see* the end of this chapter, p. 292, *et seq.*

light, a S.W.  $\frac{1}{2}$  S. course for 12 miles will lead half a mile to the westward of Sunk light. In working, tack directly the water begins to shoal on either side. The south-west end of the Shipwash will have been passed when Cork light bears N.W.  $\frac{1}{2}$  W. Whether running or working, be careful (and particularly with an ebb tide) not to bring Shipwash light to the northward of N.E.  $\frac{1}{2}$  N., in order to avoid the Shipwash.

Directions for the East Swin are on page 303, *et seq.*

**HOLLESLEY BAY**, the anchorage within the Whiting, extending from Orfordness to abreast Orford haven, is 4 miles long and from one to  $1\frac{1}{2}$  mile wide. It is devoid of shelter with the wind between N.E. by E. and East, but is protected from every other quarter, and large fleets occasionally use it, as the whole space between the Whiting and the shore is available for berthage. Hollesley church, bearing N.W.  $\frac{1}{2}$  W., is the mark for the south-western limit of the anchorage; outside, or to the south-westward of this line no protection is afforded by the Whiting, and the bottom becomes irregular and foul. Near the Whiting the bottom is sand, in the middle of the bay it is mud and sand, and towards the shore mud and clay; the depths are from 4 to 7 fathoms over the greater portion of the bay, the deepest water being near the Whiting. A sector of *green* light from Orfordness lighthouse, bearing N.E. by E.  $\frac{3}{4}$  E. easterly, is on a line with the southern limit of 4 fathoms from the shore in Hollesley bay.

**DIRECTIONS.**—Entering Hollesley bay from the eastward and south-eastward, Orfordness is to be approached from the offing with the lighthouse bearing between W.  $\frac{1}{2}$  S. and N.N.W.  $\frac{1}{2}$  W. The ness is steep-to, there being 10 fathoms water within 3 cables of it, but it is necessary to guard against an eddy which is formed on either side of the point during flood and ebb. In rounding the ness, keep within half a mile of it to avoid the Whiting, until the lighthouse bears N.E.  $\frac{3}{4}$  E., which is the mark into and through Hollesley bay by day, and at night until the *red* sector is open when by keeping that in sight a ship will pass between the Whiting and the shoal ground from the shore.

Orford west mill, in line with Orford church, bearing N. by W.  $\frac{1}{4}$  W., clears the north-east end of the Whiting in 4 fathoms.

In working, after having entered the bay, stand towards the shore by the lead, and towards the Whiting until Orfordness lighthouse

bears N.E. by E. Boyton windmill, open to the westward of Boyton hall (a white house surrounded by wood), bearing N. by W., crosses the south-west end of the Whiting in 4 fathoms. Dovercourt high light becomes obscured on a W. by S. bearing at the south spit of the bank in 5 fathoms.

The tides at Orfordness have been given on page 247.

**SLEDWAY**, the passage from Hollesley bay to the south-west part of the Shipway, has Whiting, Kettlebottom, and Bawdsey banks to the north-eastward, and the Cutler and Lower Rough to the south-westward.

**DIRECTIONS.**—In proceeding through the Sledway from Hollesley bay, Orfordness lighthouse must be kept bearing N.E. by E., until Hollesley church bears N.W.  $\frac{3}{4}$  N. ; then steer S.S.W.  $\frac{3}{4}$  W. until Hollesley church appears midway between the two eastern Martello towers Z and AA, bearing N.  $\frac{1}{2}$  W., or until Bawdsey church has been brought in line with the sea-mark, N. by W., northerly, which are leading marks through the Sledway, passing a short distance from patches of  $4\frac{1}{4}$  fathoms to eastward of the Lower Rough.

Working out or in, stand towards Bawdsey bank into 6 fathoms towards the Cutler and Rough into  $5\frac{1}{2}$  fathoms, and towards the Shipwash into 7 fathoms.

In the neighbourhood of the Cutler, keep Orfordness lighthouse N.E. as on a N.E.  $\frac{3}{4}$  E. bearing it leads along the outer edge of the shoal in 22 feet, and a patch of 18 feet lies 2 cables outside this line. Ramsholt church, open of the west end of Bawdsey cliff, bearing N. by W., clears the Cutler, passing to the south-westward ; and the Martello tower (R), upon the west end of Felixstowe cliff, bearing W. by N.  $\frac{3}{4}$  N., leads to the southward of both the Cutler and Bawdsey banks.

Martello tower (P), a little open of Felixstowe cliff, W. by S.  $\frac{1}{2}$  S., leads within the Cutler.

Dovercourt high light becomes obscured on a W. by S. bearing at the north-east end of the Cutler.

The directions, in continuation towards the Thames, are on pages 296, *et seq.*

**ROUGH CHANNEL**, the passage from the Shipway to Harwich Pitching ground, has for its south-west boundary the Lower Rough, Cork sand, and Cork ledge. The leading mark is, Harwich old low light-tower open north of Landguard fort, bearing N.W. by W.  $\frac{1}{2}$  W.,

or Landguard point open of Cork light-vessel. The night leading mark is Cork light bearing W. by N.  $\frac{3}{4}$  N.

**ORFORD HAVEN**, opening into the south-west part of Hollesley bay, through a foreshore composed of shingle, is not readily to be discerned from the sea, but the position of the entrance may be known from its being near the northernmost Martello tower on this part of the coast and from the cluster of low cottages, named Shingle-street, standing close to the north-eastward of it.

Orford haven is formed by the outlet of the rivers Alde and Ore. These rivers meet near Snape bridge, and the stream then has a winding course through broad muddy flats to Slaughden quay, near Aldeburgh, where the original outlet would seem to have been. Having approached to within 73 yards of the sea, the river bends abruptly to the south-westward ; 6 miles lower it encircles Havergate island, and receives the waters of the Butley, and finally reaches its outlet at 9 miles below Aldeburgh, and 2 miles from the north-east end of Bawdsey cliff. It may be mentioned as a peculiarity of this river that, except in one place a little below Slaughden quay, it is free from shoals.

The frequent presence of the North Sea Fleet in Hollesley bay, during the continental war, ending in 1815, gave an increased importance to the Ore, and several plans were laid before the Government of the period for cutting through the beach, and converting the river into a wet dock, but they were all deemed impracticable.

Orford has a small quay at which coasters discharge. The church and castle have been noticed on page 264. The town is small and meanly built, but it was formerly of more importance, having sent three ships and sixty-two men to the siege of Calais in 1359 ; it possessed also a considerable trade, which gradually left it owing to the defective state of the harbour.

The custom-house is at Woodbridge, of which Aldeburgh is also a creek. The trade of Orford consists of exports of corn and wool, and imports of coal and timber. Aldeburgh imports foreign corn, besides coal and timber ; the exports are chiefly corn and wool ; the whole trade giving employment to many vessels of from 50 to 150 tons each.

Population in 1871 :—Orford, 1,022 ; Aldeburgh, 1,990.

There are quays at Iken and at Snape bridge, from whence considerable quantities of barley are shipped for London.

**Entrance and Bar.**—The entrance to Orford haven is subject to frequent change, and there were lately persons living whose memories went back to the time when it was  $1\frac{1}{2}$  mile westward of its present position, but wherever situated, its principal features remain the same. The extremity of the eastern beach is named the North weir, or North ear, below which are several detached banks of shingle termed the Haven knolls, and through these the river maintains a channel, and generally a swatchway besides; 5 feet is the average depth over the bar at low-water springs.

**DIRECTIONS.**—There are several beacons for guiding through the channel and swatchway into Orford haven, and they are shifted immediately any change occurs at the entrance, but the liability to change precludes any directions being given. Four harbour pilots reside at Shingle-street, and they are to be procured by hoisting the usual pilot flag by day, and a light by night, but should a vessel be forced to run for the haven at a time when the pilots cannot venture off, they then station themselves upon the leading beacons and direct the course to be steered by the waving of flags. The most difficult time for entering is with the wind from N.N.E., on account of the nature of the channel, and the weight of sea then upon the bar.

**TIDES.**—It is high-water, full and change, at Orford bar, at 11h. 30m., Orford quay at 0h. 30m., Slaughden at 1h., and at Snape bridge at 3h. Ordinary springs rise  $7\frac{1}{2}$  feet at the bar,  $7\frac{1}{2}$  feet at Orford quay,  $7\frac{1}{2}$  feet at Slaughden quay, and 6 feet at Snape bridge, the limit of the navigation.

**WOODBIDGE HAVEN**, or Bawdsey haven, at the south-west end of Bawdsey cliff, is formed by the outlet of the Deben, a river which has a course of 30 miles by Debenham, Wickham Market, and Woodbridge, and joins the sea, as in the case of the Ore, through detached and shifting banks of shingle.\*

**Woodbridge**, the principal town, is upon a bold and diversified slope on the right bank of the river,  $8\frac{1}{2}$  miles within the bar; its church, a noble structure of flint and freestone, has a tower 180 feet high, but as the town is not visible from the sea, a further description of it is needless. There are a custom-house, bonded warehouses, and several quays and slip docks, in which vessels lie and discharge securely. The trade is in corn, malt, coal, timber, wine and spirits, conveyed in vessels, varying in burden from 30 to 200 tons, and

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\* See plan of Woodbridge haven on Admiralty chart, Harwich Approaches, No. 2,052

drawing from 6 to 13 feet. The arrivals in 1880 were 806 vessels, with a total tonnage of 43,848 tons. Population, 4,403 in 1871.

The navigation for sea-going vessels ends at Woodbridge, but vessels of light draught reach Melton,  $1\frac{1}{2}$  mile higher up. The river is in its natural state and unimproved ; the sides of the channel are marked by poles and bushes instead of buoys, and as the deep water ends one mile below Woodbridge, vessels are often forced to discharge a portion of their cargoes to admit of their reaching the quays at that place.

**Bar and Entrance.**—The bar of the Deben is constantly varying in height and position, and the channel also is similarly affected, but the pilots move the leading beacons, or “meets,” as they are termed, according to circumstances. At night, lights are shown from these beacons when needed. The approach to the bar is marked by a *red* conical buoy marked W.E. Haven.\*

The least depth in the western channel over the bar of the Deben at low-water springs, when surveyed in 1873, was 2 feet. As at the Ore, entry is difficult with the wind and sea on, but happily the close neighbourhood of Harwich harbour renders such an attempt unnecessary. There are ten pilots for the service of the bar and river. Vessels drawing 11 feet can reach the docks or slips at Woodbridge during springs, and those of 9 feet draught at neaps ; and it may be noted that any vessel able to cross the bar, may also reach Kingston quay, one mile below Woodbridge.

**Rocket** apparatus for saving life is kept at the haven.

**TIDES.**—Springs rise 12 feet at the bar of the Deben, 10 feet at Kingston quay, and 7 feet at Wilford bridge ; and high-water occurs at those points, respectively, at 11h. 45m., 0h. 35m., and 0h. 55m.

**The COAST.**—Cliff begins half a mile to the south-westward of the Deben, and, alternating with grassy bank, continues for 2 miles to Landguard east beach, when the high ground trends more westerly.

**FELIXSTOWE** stands nearly midway, upon the summit and face of the bank ; the church with a stunted spire is not prominent, but several large and handsome villas are near the water's edge. The sea has made great ravages on this shore, and the evil was increased by the partial removal of a massive ledge of cement stone from the frontage which had served the purpose of a breakwater, besides which, its removal permitted the unobstructed passage of shingle to the south-westward, to the great detriment of Harwich harbour.

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\* For position of buoys, see the end of the Chapter, page 292.



**LANDGUARD FORT.**—From Felixstowe cliff, a low shingle beach extends for 2 miles to the south-westward to Landguard fort, where it forms the point on the eastern side of the entrance to Harwich harbour. The fort was built in the reign of James I. for the defence of the harbour, and was subsequently enlarged and supplied with water led in pipes from the neighbouring village of Walton. It has recently been converted into an armour-plated fort.

**HARWICH LIGHTS.**—The lights in the neighbourhood of Harwich consist of leading lights at Dovercourt cliff to guide into the entrance; of a light showing *red* and *white* sectors on Landguard point as guides to the turning points; of a *red* light on the harbour pier at Harwich, to clear the Guard bank; and of smaller lights at the end of the piers, &c., in the harbour.

**Harwich Church.**—From the approach to Harwich harbour, the buildings in the town are very prominent, the principal one being the church dedicated to St. Nicholas; it was erected in 1821, to supersede an ancient structure, and is of white brick with stone buttresses. The chimney of the cement works at Dovercourt is a very plain mark. Other conspicuous objects are the windmill at Walton; the *red* beacons just north of Landguard fort; the Martello tower and Manor house on east beach; and the Dovercourt leading lighthouses. Another plain object is a circular redoubt on an artificial mound between the town and Beacon cliff.

**Landguard Point Light.**—A timber framed lighthouse stands 390 yards from the extremity of Landguard point, and exhibits a *fixed* light 33 feet above high-water, visible in clear weather 10 miles; on approaching the harbour it is not seen until the Andrews buoy has been passed, or when it bears N.N.W.; it then shows *red* to as far in as the Beach-end buoy, when it changes to *white* on a N.E. bearing, and so continues up the harbour, except in the direction of the North Shelf buoy, which is struck by a narrow strip of *red* light between the bearings of S. by E.  $\frac{1}{2}$  E. and S.S.E.  $\frac{1}{2}$  E.

**Harwich old Lighthouses,** built of brick and painted white, stand on the south side of the town, 218 yards apart, in a N.W.  $\frac{3}{4}$  N. and S.E.  $\frac{3}{4}$  S. direction; one is 80 feet and the other 37 feet in height from the ground. The lights from these towers have been discontinued for some years in consequence of the extension of Landguard point to the south-westward.

**Dovercourt Lights.**—Cliff succeeds to the south-west of Harwich, and slopes gradually down to the opening into Hamford water, 4 miles from that town. This shore is backed by a gently undulating country, with Dovercourt church, much obscured by wood, upon the outline. On the shore abreast the village are Dovercourt lighthouses, white, octagonal, standing on piles N.W. by W.  $\frac{1}{2}$  W. and S.E. by E.  $\frac{1}{2}$  E. from each other, 208 yards apart; from both of which *fixed white* lights are exhibited. The higher light is elevated 45 feet above high-water, and is visible at the distance of 11 miles between the bearings N.  $\frac{1}{4}$  W. and W. by S.; on the latter bearing it marks the northern edge of Cutler shoal, and the south spit of Whiting bank. The lower light is 27 feet above high-water, and visible in clear weather  $9\frac{1}{2}$  miles; a *bright* sector is shown between the bearings N.W. by W. and W. by N.  $\frac{1}{4}$  N., but the light is visible between the bearings West and N.W.  $\frac{1}{2}$  N.; from these bearings the light gradually fades out. These lights in line, one above the other, (when they show bright,) bearing N.W. by W.  $\frac{1}{2}$  W., lead into the Rolling ground between the Andrews and Inner Ridge buoys, but nearer to the latter than to the former.

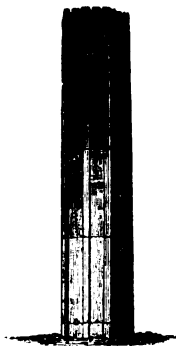
**Landguard Fort Pier Light.**—A *fixed green* light is shown from the head of the jetty at Landguard fort.

**Felixstowe Pier and Lights.**—A pier, 608 feet long, and having 16 feet depth at low-water spring tides at its outer end, projects from the shore of the harbour half a mile to northward of Landguard fort. The head of the pier is marked by a *fixed red* light. To the northward of this pier are two groynes from the shore marking the channel into Felixstowe dock. On the outer end of the south groyne is a *fixed green* light.

**Harwich Camber Lights.**—Two *green* lights are exhibited from the ends of the east and west quays at Harwich Camber, and a *red* light from the central quay, which is only visible between the bearings of West and W. by S.  $\frac{3}{4}$  S. and serves to guide vessels round the Guard shoal. Vessels are not to anchor between these bearings.

**Parkeston Quay Lights.**—One high and two low *red* lights are shown from poles at Parkeston quay. The high light between the two low *red* lights leads up to the berthage.

**NAZE**, indifferently termed Walton or Harwich Naze, on the south-east side of Hamford water, and S.S.W.  $\frac{3}{4}$  W., 4 miles from Landguard point, is a cliff of a similar character to that at Bawdsey. A tall brick tower, 88 feet high, stand upon the summit of the Naze a little within the brink of the cliff; it was built by the Trinity House as a sea-mark. Walton hall, is used with the tower, as a mark for Goldmer gateway.



Naze tower

The village of Walton-le-Soken, one mile to the south-west of the tower, is seated in a dip of the cliff; it is resorted to as a watering-place, and there are several handsome terraces with a jetty for the accommodation of visitors. A branch of the Great Eastern railway has been extended to it.

**Life-Boat.**—A life boat is stationed at Walton-on-the-Naze.

**HARWICH**, a town of great antiquity, stands upon the north part of a peninsula formed by a bend of the river Stour; it has derived its importance from its noble harbour, which is the only safe one between the Humber and the Thames; the bottom is clean, with good holding-ground; the depth into it, formerly 11 feet only, has been increased by dredging to 17 feet at low-water, and it is capable of holding a large number of vessels of moderate draught. Edward III. sailed from it to gain his noted victory over the French at Sluys, and it is besides associated with many important events in English history.\*

At the beginning of the century Harwich was in a flourishing state, owing to the strong garrisons maintained in the town and at Landguard fort; to a thriving fishery; to the works carried on in the Government dockyard; and to its being the rendezvous of the sailing packets which performed the mail service to the north of Europe; but after the establishment of peace in 1815, the fishery, which in 1778 had been worked by 78 vessels of 40 tons, employed only 10 vessels; the Government works were discontinued, and in 1832 the mail packets were removed to the Thames.

The entrance to the harbour has undergone striking changes since the Admiralty survey of it in 1804. At that time vessels sailed in through a narrow 7-fathoms channel close to the walls of Landguard

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\* See Admiralty chart of Harwich harbour, No. 1491; scale,  $m = 10\cdot0$  inches.

fort ; this continued without material alteration till 1826, when, in consequence of the removal of the ledge of cement stone which fronted Felixstowe, and with that the obstruction to the passage of shingle to the south-westward, Landguard point gradually advanced, closed up the deep-water channel, and reduced the available depth into the harbour to 11 feet. In 1845, the attention of the Government having been directed to these circumstances, and to the impending ruin of this noble natural harbour, a stone breakwater, 508 yards long, was constructed from the foot of Beacon cliff outwards to confine the scourage of the stream to the navigable channel, and at the same time extensive dredging operations were entered upon, which have resulted in the obtaining a depth of 17 feet into the harbour at low-water springs. Experimental wooden groynes, for stopping the progress of the shingle to the south-westward, have also been formed at Felixstowe, and at Landguard beach nearly abreast the lighthouse ; the latter work curves to the southward, its outer end terminating at the southern margin of the Andrews is marked by a beacon : it has already produced a beneficial effect.

A small inner harbour or camber has also been formed on the north face of the town by building a pier in a north-west direction, with a transverse arm towards E.N.E. This pier is the terminus of the railway from Harwich to London ; and partly covers in the Government dockyard (now held on lease for mercantile purposes), where vessels from the size of a 74-gun ship downwards were formerly built ; and many fine merchant-vessels, up to 2,000 tons burden, have of late been built. The dockyard is now principally used for purposes of repair and refitting, and is furnished with a patent slipway, capable of taking up a vessel of 400 tons.

In addition to the pier above referred to, the Great Eastern railway company have constructed one of larger dimensions, extending in a N. by E. direction for 450 feet from the west angle of the town ; from which a line of passenger and cattle steamers formerly maintained communication with Rotterdam, Antwerp, and other continental ports, but this traffic is now carried on from Parkeston quay farther up the harbour.

Harwich, with the rapidly increasing suburb of Lower Dovercourt, is much frequented by summer visitors.

Vast quantities of cement stone, or septaria, dredged up from West rocks and the shoals in the neighbourhood, are exported from Harwich to London, and to various parts of the continent, a portion

only of the stone being converted on the spot. The dredging vessels are about one hundred and fifty in number, and are each manned by a crew of four men.

The trade of Harwich, which from the reasons above stated has decreased so much of late years, bids fair to regain some of its ancient consequence. The port has been approved of as a warehousing port, as well as a packet station. There is now steam communication with Rotterdam and Antwerp; the foreign cattle trade is increasing, and likely to become extensive; merchandise of most kinds is imported. The number of vessels belonging to Harwich on the 1st January, 1881, was 154, forming a total of 15,980 tons. The number of vessels that entered the port in 1886 were 2,302, of an aggregate tonnage of 578,259 tons. Population 7,810 in 1881.

**Parkeston Quay.**—For the greater convenience of landing goods and passengers, the Great Eastern railway company have constructed a pier 1,800 feet in length on the outer edge of the mud bank from Ramsay Ray, or Ray island, one mile above Harwich. Each end of the pier is connected by embankments to the shore and between the embankments a large tract of ground has been reclaimed. The line of railway between London and Harwich now runs along these embankments and by Parkeston quay, where a large Hotel has been constructed as well as spacious warehouses, abattoirs, &c. The depth alongside the quay is from 8 to 14 feet at low water; off it are a set of seven mooring buoys for the convenience of the steamers running between Parkeston quay and Antwerp.

**Felixstowe dock.**—A tidal basin has been dug out of the marsh ground at Felixstowe to the north of Landguard fort, and piers or groynes run out from the shore to mark the entrance. The basin has about 700 feet of wharfage accommodation at present, and a depth of from 17 to 20 feet at low water, with 16 to 18 feet in the entrance channel. A railway connects the basin with Ipswich and a ferry steamer runs periodically from Felixstowe pier to Harwich camber.

**Supplies.**—Coal can be procured and vessels of light draught coaled alongside the Harbour camber jetty, or in Felixstowe dock; or alongside Parkeston quay. Marine supplies of every description are plentiful, and water is brought in from Upper Dovercourt; excellent water may likewise be obtained from the suburb of Lower

Dovercourt ; also from Shotley and Erwarton on the opposite side of the Stour, and in Felixstowe dock. A steam-tug belongs to the port.

Vice-Consuls for most nations are resident.

**A Life-Boat** is stationed at Harwich.

**IPSWICH**, the chief town of Suffolk, is on the left bank of the Orwell,  $9\frac{1}{2}$  miles from Harwich harbour.\* The river is navigable for sea-going vessels to as far as Ipswich, where it is first crossed by an iron bridge ; and three-quarters of a mile farther up it is connected by lock with the river Gipping, by which barges reach Stowmarket.

At high-water the Orwell possesses a breadth of half a mile, with well-wooded banks, which are studded here and there by villages, gentlemen's seats, and parks. For the first four miles above Harwich harbour the river has a good low-water breadth, then occurs Butterman's bay where are screw moorings and buoys, in 22 feet at low-water of spring tides, for the use of large vessels ; the channel then gradually decreases in width and depth, and 2 miles farther there is anchorage in 15 feet at Mulberry Middle ; from thence to Ipswich there is at present (1881) a depth of 7 feet at low-water, or  $20\frac{1}{2}$  feet at high-water springs. The channel for 5 miles below Ipswich is well buoyed and beacons, but it is for the most part narrow and tortuous. Several improvements have been made from time to time, among which may be mentioned the conversion of the bed of the river abreast the town into a wet dock, which was opened in 1842, and the formation of a compensating channel. Two extensive cuts for straightening the river were also made, and its bed was lowered by dredging. One of the results has been that the flow of a spring tide at the town, which in 1804 was only  $6\frac{1}{2}$  feet, has been increased to  $13\frac{1}{2}$  feet.

**The Dock** has an area of 30 acres, with 3,400 yards of frontage viz., 1,400 yards of quayage in the dock, 1,000 yards of in-quayed wharfage, and 1,000 yards quay outside the dock ; a branch of the Great Eastern railway is led along it : the depth of water over the greater portion of the dock approaching the quays is  $19\frac{1}{2}$  feet at neap tides. A new entrance was completed in June 1881, the lock being 300 feet long between the gates, 50 feet wide, with a depth of  $23\frac{1}{2}$  feet over the sills at high-water of ordinary springs. The old entrance, which is only 140 feet in length, is now disused. The largest vessel that has entered was 2,000 tons burthen.

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\* See Admiralty chart, Orwell and Stour rivers, No. 2693 ; scale,  $m = 3\cdot8$  inches.

Since the opening of the dock the trade of the port has much improved, and ships of a larger class use it. The principal trade is in corn, coal, and manures ; it also receives spirits, wine, and timber, direct from abroad, for which it is a bonded port. There are large manufactories for agricultural and railway implements, flour and seed crushing mills, extensive breweries, and soap and cement works, as well as ship-building yards and repairing slips. Steam packets run twice a week to Hull, Newcastle, &c.

The shipping of Ipswich consisted on the 1st of January 1881 of 115 vessels of 9,103 tons. About 2,000 vessels enter the port annually of an aggregate tonnage of 145,000 tons. Population, 50,762 in 1881.

**Supplies.**—Coals can readily be obtained, and vessels coaled in the dock with facility. There are several large iron works where repairs to machinery can be executed. All ordinary supplies are plentiful. There is also a sailors home and a hospital.

There are three steam tugs plying on the Orwell.

**Pilots.**—There are ten licensed pilots, who have two stationary vessels, one near the entrance of the river, and the other at Mulberry Middle.

**MANNINGTREE and MISTLEY.**—Manningtree is on the right bank of the Stour, 10 miles above Harwich. The Stour, taking its rise in the south-west corner of Suffolk, flows to the eastward past Manningtree, and unites with the waters of the German ocean at Harwich. It is navigable for river craft to as far as Sudbury, and it is crossed by a stone bridge at Cattawade, half a mile above Manningtree, and also by the Great Eastern railway.

From Harwich to Manningtree the basin of the Stour is nearly one mile wide, and is extensively occupied by mud-flats, which are intersected by numerous creeks. At low-water, the channel for 5 miles to Wrabness is broad and straight, when it suddenly becomes contracted, and so continues with a winding course to Manningtree.

Only vessels of light draught can reach Manningtree, and the principal place for shipping is at Mistley, three-quarters of a mile lower down on the same side, where is deeper water, and an extensive range of quays, warehouses, and granaries. The church at the latter place is a prominent object from the approach.

The navigation of the Stour is direct and simple to as far as Wrabness, but above that point the aid of a pilot becomes necessary.

During springs, vessels drawing 12 feet reach Mistley, and those of 7 feet ascend to Manningtree. The trade is of the same character as that of Ipswich.

**APPROACHES TO HARWICH HARBOUR.**—The approach to Harwich harbour is through the Rough channel, a narrow and shallow gateway, which in parts is less than three cables wide. On the northern side of the channel are the shoals extending from the shore, an extensive mass of rock, originally the basement of land which has been washed away. On the southern side are the Cork ledges and Ridges, &c. The shoals in the immediate approach to, and in, Harwich harbour will be first described, and afterwards the main body which are more in the offing abreast the Naze.

**Felixstowe and Wadgate Ledges** are rocky shelves or ledges projecting upwards of one mile to the southward from Felixstowe cliff with 3 fathoms at the outer part. Felixstowe ledge is marked by a *red conical* buoy.\* The mark for the coasting track, the Cork land open of the Naze, S.W.  $\frac{3}{4}$  W., leads outside them, and, while working, do not go into a less depth than 4 fathoms. The indifferent anchorage abreast is named Felixstowe road.

**Platters, Andrews, and Beach End.**—The immediate channel into Harwich harbour, through what are termed the Pitching and Rolling grounds, is bounded to the north-east by the Platters, Andrews, and Beach-end shoals, extending nearly continuously from Landguard point to the eastward. The Platters has 3 feet upon it; and Andrews spit, which is steep-to, 5 feet.

**BUOYS.**—These shoals are marked by the following buoys, viz.:—a *red conical* buoy on the south side of the Platters; a *red conical* buoy on the south side of Andrews spit, and a *red bell* buoy on the south-west side of Beach End.\*

**CORK LEDGE,**  $1\frac{1}{2}$  mile south-east from the Platters, bounds, with the latter shoal, what may be termed the outer gateway into Harwich harbour. The ledge is a patch of rock half a mile across, and with 10 feet upon it. Midway between it and the Platters is the Cork spit, with 18 feet over it.

**Cork knolls** consist of foul ground lying outside the Cork ledge. The shoalest water, a patch with  $3\frac{1}{4}$  fathoms upon it, lies E. by N.  $\frac{1}{4}$  N.,

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\*. For position of buoys, see the end of this chapter, page 292.



1½ mile from the Cork ledge, shallow ground of 20 and 22 feet being nearly continuous between them.

**CORK LIGHT-VESSEL.**—In 1844, a light-vessel was placed in 4½ fathoms, to the northward of the northern end of the Cork ledge, exhibiting at 35 feet above the water a *white* light, which *revolves every half minute*, and may be seen in clear weather from a distance of 10 miles.

**Fog Signal.**—In foggy weather a horn gives *one* blast of *four seconds* duration every *fifteen seconds*.

The vessel lies with the cement-works chimney at Dovercourt, in line with Landguard light, bearing W.N.W.; and the south-west land, over Walton pier-head, well open of the Naze, S.W. by W.; Cutler buoy, E.N.E., distant 2 $\frac{2}{10}$  miles; Platters buoy, W. by N., 1 $\frac{3}{10}$  mile; Andrews buoy, W.  $\frac{3}{4}$  N., 1 $\frac{8}{10}$  mile; Outer Ridge buoy, W. by S.  $\frac{1}{3}$  S., 1 $\frac{9}{10}$  mile; and Inner Ridge buoy, West, 1 $\frac{2}{10}$  mile.

**RIDGE**, a rocky shoal abreast the inner part of the Platters, and S. by E. 1½ miles from Landguard point lighthouse, is a shoal head on the edges of the 3-fathoms bank, extending from the shore between Harwich and the Naze. It is 4 cables long in a N.N.E. and S.S.W. direction, and 2½ cables broad. The least depth over it is 9 feet.

**BUOYS.**—The Ridge is marked by two *red* and *white* can buoys, one at the north and the other at the south-east end.\*

**HALLIDAY FLATS** occupy all the outer portion of the deep bight between Harwich and the Naze; they consist for the most part of rock, several patches of which have only 5 and 6 feet upon them at low water; the north-eastern edge, extending from the Ridge north-west, afterwards trends more northerly towards Harwich harbour, and joins the Cliff foot, forming the southern and western boundary of the channel into Harwich harbour.

**Anchorage.**—The approach to Harwich harbour from the eastward passes through the two outer anchorages, the Pitching and Rolling grounds, having the Platters shoal and Andrews spit to the northward, and the Cork ledge and the Ridge to the southward. The channel between the Andrews and the Ridge is about 700 yards wide, and in it the depth of 16 feet is likely to be passed over; it leads directly to the entrance of the harbour between Landguard beach and Cliff-foot rock. Anchorage may be taken in the Pitching

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\* For positions of buoys, *see* end of this chapter, page 293.

ground in 5 or 6 fathoms, with Orford castle, open of Bawdsey cliff three times the distance between the church and castle, bearing N.E.  $\frac{1}{2}$  E.; and Cork light-vessel, East, southerly, but the former mark can only be seen in clear weather. In the Rolling ground, anchor in from  $4\frac{1}{2}$  to 6 fathoms, with the beacon on the outer end of Landguard point groyne and the S.E. red beacon in line, N.N.E.  $\frac{1}{2}$  E.; and Harwich old low lighthouse, midway between the church and old high lighthouse, N.N.W.  $\frac{1}{4}$  W.

**HARWICH HARBOUR SHOALS.**—**Beach-End** is the toe or under-water projection of the beach at Landguard point, extending S.W.  $\frac{1}{2}$  W., about 4 cables from the high-water extremity of the point; on the outer end the depth is 9 feet, with a swatchway of 12 to 14 feet between it and the shore. Beach-end bell buoy has been already noticed.

**Cliff Foot Rock**, 2 cables across, and with 5 feet over it at low-water, lies directly off Beacon cliff. It is marked to the south-eastward by a *can* buoy, *chequered red* and *white* and surmounted by a *staff* and *cage*.

The channel between Cliff-foot buoy and the Beach-end or toe of Landguard point is only one cable wide, and forms the inner gateway or immediate entrance into Harwich harbour.

**A Breakwater**, 508 yards long, and marked at its outer end by an iron staff and globe, extends south-east from Beacon cliff towards Cliff-foot rock; it was constructed for the purpose of concentrating the scour of the tidal stream upon Landguard point, in order to check the further extension of the beach to the south-westward.

**Buoys.**—Up to a recent date there were several shoals in Harwich harbour, namely, the Altar, Cod, Glutton, Bone, Gristle, and Guard; but these have been either wholly or in part removed by dredging, and some of the buoys which marked them have been removed; it is, consequently, no longer necessary to make the distinction of Eastern and Western channels. Four *can* buoys, painted *red* and *white*, alternately in stripes or chequers, however, lie along the outer part of the Guard, or Harwich shelf, as it is sometimes called, viz.: the North cliff, South shelf, North shelf, and Guard buoys, the latter having a staff and cage. These buoys are to be left on the port side in entering.

**DIRECTIONS for Harwich Harbour.**—Light-draught vessels may enter Harwich at any time, but with vessels exceeding 15 feet draught the state of the tide must be considered, as 15 feet is the depth

in several places at low water in the channel leading to the anchorage in the Stour. Approaching from the eastward, and having arrived abreast the Cutler shoal, with Orfordness lighthouse bearing N.E.  $\frac{1}{4}$  E., and Cork light-vessel bearing W. by S. southerly, distant 3 miles, steer for the light-vessel on that bearing, and pass close to the northward of her; then bring the light-vessel E.  $\frac{1}{4}$  S. while proceeding through the Pitching ground to between the Andrews and Inner Ridge buoys, and when Dovercourt lighthouses appear in line, N.W. by W.  $\frac{1}{2}$  W., keep them so, whilst passing through the Rolling ground up to Beach-end buoy. Having arrived abreast the buoy, round gradually to the north-eastward between Beach-end and Cliff-foot buoys, and afterwards keep from one to two cables off the Suffolk shore until the red leading beacons north-east of Landguard fort appear in line, bearing S.E. southerly, which mark will lead between Gristle and Guard shoals, with 14 feet least water, and when the Guard buoy has been passed take up an anchorage northward of the town. The best berth is with Harwich church, bearing South, one cable off the pier, in 5 fathoms at low-water; but the channel of the Stour for several miles up affords excellent and secure anchorage.

**District Guard Ship.**—A district Coast Guard ship is stationed at Harwich, and moorings for her accommodation and the tenders attached to her have been laid down to the northward of the pier.

**CAUTION.**—In order to facilitate the approach to the anchorage off the town, and to leave a clear passage for steam-vessels to the piers, there is exhibited at the end of the North jetty a small dioptric light, previously noticed, which shows *red* between the bearings West and W. by S.  $\frac{3}{4}$  S.; and vessels are cautioned not to anchor within the limits of this *red* light unless they are to the eastward of the *red* light which is shown from Landguard lighthouse, cutting North Shelf buoy. The northern limit of this exempted anchorage may be known in the daytime by bringing Upper Dovercourt church, open north of the railway pier, bearing W.S.W.

In scant south-westerly winds, the leewardly round along the Suffolk shore may be avoided by steering from a midway position between Beach-end and Cliff-foot buoys, the same distance to the eastward of the other buoys, until the two *red* spar-beacons with circular tops, standing on the beach within Landguard fort, appear in line, bearing S.E. The beacons, which are, respectively, 31 and 36 feet high, and 245 yards apart, should not be opened to the south-

ward, as Harwich shelf is steep-to ; there are 14 and 12 feet over the Gristle and Bone at low-water springs.

The deepest and widest channel is between the Bone and the Suffolk shore, but marks for this cannot be given, and it is not buoyed.

**Working.**—Standing to the northward towards the Andrews, tack when Dovercourt high lighthouse is open thrice its breadth to the northward of the low lighthouse, and towards the Inner Ridge and Halliday flats by the lead. In the channel between the Beach-end and Cliff foot, and when standing towards the Suffolk shore, the lead is not sufficient guide. Afterwards, working towards Harwich and standing to the southward, tack when the beacons are in line. Shotley flat may be closed until Walton east windmill appears over Martello tower (N.), bearing E.  $\frac{1}{4}$  S.

Rounding Shotley point, in order to pass from the Stour into the Orwell, keep the summit of the old high lighthouse on with the east part of Harwich church, bearing S.S.W.  $\frac{1}{3}$  W. ; this mark clears Horse bank in 15 feet at low-water.

**By Night.**—Close with Cork light bearing W. by S. ; pass to the northward of the light-vessel, then keep the light E.  $\frac{3}{4}$  S. until Dovercourt lights appear in line, bearing N.W. by W.  $\frac{1}{2}$  W. Running in upon this line, Landguard *red* light will first appear shortly after the Andrews and Inner Ridge buoys have been passed, and when it changes to *white* at Beach-end buoy, bring the vessel's head round to the northward and north-eastward, and anchor under Landguard fort.

**CAUTION.**—The ebb-stream sets strongly to the eastward across the Andrews and Landguard point shoals, and to the S.S.W. across Cliff-foot rock ; some care is, consequently, necessary to guard against it in light winds.

**TIDES.**—It is high-water, full and change, in Harwich harbour, at 0h. 6m. ; springs rise  $11\frac{1}{2}$  feet, neaps  $9\frac{3}{4}$  feet, and neaps range 8 feet. At Pinmill, it is high-water at 0h. 20m. ; at Downham reach, at 0h. 27m. ; and at Ipswich, at 0h. 35m. Spring tides rise 12 feet at Pinmill, 12 feet at Downham reach, and  $13\frac{1}{2}$  feet at Ipswich dock.

It is high-water, full and change, at Wrabness, at 0h. 29m. (23m. later than at Harwich) ; at Mistley quay, at 0h. 48m. ; and at

Cattawade bridge, at 1h. 8m. Springs rise 12 feet at Wrabness, 11½ feet at Mistley quay, and 4¼ feet at Cattawade bridge.

**HAMFORD WATER** is a natural harbour or inlet at the head of the bight between Harwich and the Naze. Within Walton Stone point, which bounds the entrance to the southward, the water space divides into two main branches, running to the southward and westward, and named, respectively, Walton channel and West water; numerous creeks diverge from them, running between islets and low embanked marshes, which have been gradually gained from the sea.

Hamford Water is available in north-easterly gales for small vessels which have lost their anchors, and are unable to fetch into Harwich harbour. A proper attention to the directions to be given will enable the seaman so circumstanced to enter Hamford water without difficulty, and he may run his vessel upon the mud when inside without her sustaining any injury.

The coast-guard vessel is hauled up on Walton Stone point. Vessels discharge cargoes in West water into barges for Oakley, Beaumont, Kirby, and Walton, where are places for unloading, and also for the shipment of corn for the London market.

The approach to Hamford water is over Halliday flats, and the channel is between Pye sand and a broad shelf from the main, both of which dry at low-water; between these there is but 4 feet water, and the channel when near Walton Stone point is but 100 yards in width. The least water, 4 feet, is 2 miles below Walton Stone point; when inside Pye sand it deepens to 5 and 7 fathoms.

**DIRECTIONS.**—From the inner part of the Rolling ground, steer to the westward until Felixstowe and Landguard points are in line, bearing N.E. by E. ½ E. This mark leads over the flat of 4 feet to within the point of Pye sand; the channel must now be kept by steering a little to the left of Duckmore creek beacon, and by observing the ripple on the edge of the banks on either side.

**NAZE FLATS and CHANNELS.**—The shoals to the southward of Harwich, embraced by the collective term Naze Flats, are Pye sand, Naze ledge, Stone banks, Cork sand, and West rocks; having between them the narrow and somewhat intricate passages, Medusa, Inner, and Gullet channels, often used by vessels coasting alongshore, or passing from or towards Harwich harbour.

**PYE SAND**, already mentioned as forming the south-east side of the channel into Hamford water, extends from Walton Stone point

N.E. by E.  $\frac{1}{2}$  E. for  $1\frac{3}{4}$  mile, its north-east end being S.W. by W.,  $1\frac{1}{4}$  mile from Landguard point. This sand dries at low-water.

**NAZE LEDGE**, or flat, shelves gradually out for one mile from the Naze, with 8 to 9 feet upon the outer part of it. There were formerly patches of stone named the North, Middle, and South bars upon the north side of Naze ledge, but they have been removed of late years by the cement-stone dredgers.

**STONE BANKS** lie out  $1\frac{1}{2}$  miles to the eastward of the Naze, and are composed of a mass of rock and loose stones one mile across each way, with several patches of 6 feet; they are marked on their south-west edge by a *can* buoy, painted in *red* and *white* vertical stripes.\*

**CORK SAND** extends S.W.  $\frac{1}{2}$  S. and N.E.  $\frac{1}{2}$  N. for  $2\frac{1}{2}$  miles, and joins the north-west end of West rocks; it is very shoal throughout, having several ridges dry at low-water. Three fathoms upon its north-east end, is S.E. by E., one mile from Cork ledge. It is marked on its north-east extremity by a *can* buoy, painted in *red* and *white* vertical stripes.\*

**WEST ROCKS**, the outermost of the group, and from whence great quantities of cement stone are every year removed by dredging, extend in a N.W. and S.E. direction, and are  $2\frac{1}{2}$  miles long and one mile broad. The body of these rocks has a depth of one to 5 feet at low-water; 9 feet depth upon their outer end, is about E. by S.  $\frac{1}{2}$  S.,  $5\frac{1}{4}$  miles from the Naze tower. On their south-eastern side they are marked by a *black conical* buoy.\*

**MEDUSA CHANNEL**, deriving its name from an incident in Nelson's history, is used by small vessels passing from Harwich into the Wallet, or *vice versa*; it lies between Halliday flats and Naze ledge to the westward, and the Ridge and Stone banks to the eastward; the least depth at low-water is 10 feet, but it is narrow and indirect.

**DIRECTIONS**.—From the Rolling ground, bring the outer house on Landguard point on with Walton Martello tower (N), bearing N.  $\frac{3}{4}$  E., which mark directs between Halliday flats and the Ridge. When within one mile of Stone banks buoy, the Cork land, or Burnthouse cliff, will appear outside the Naze, bearing S.W.  $\frac{3}{4}$  W. The latter mark kept on for a short distance will lead through the narrowest part of the channel; then steer close past the west side

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\* For positions of buoys. *see* page 294.

of the buoy, and continue onward one mile further, when a course may be taken either up the Wallet, or for Goldmer gat.

**INNER CHANNEL**, the common coasting track of vessels proceeding from Hollesley bay to the south-westward in off-shore winds, so as to avoid the round by the Lower Rough and West rocks, is between Felixstowe ledge, the Platters, and the Ridge to the north-west, and Cork ledge and Stone banks to the south-east.

Burnthouse cliff, open of the Naze, bearing S.W.  $\frac{3}{4}$  W., will lead clear of all dangers from abreast Woodbridge haven to nearly up to Stone banks, when the vessel must be kept to the westward, and the directions for Medusa channel followed.

**GULLET CHANNEL**, one cable wide, is the passage between Stone banks and West rocks; it has a hole of 5 to 7 fathoms in it, with 7 to 9 feet on either side of the passage. From abreast Cork light-vessel, and passing to the westward of Cork sand, Alderton rectory (a large red house, difficult to see in the wood), showing over the west end of Bawdsey cliff, bearing N.N.E.  $\frac{3}{4}$  E., leads to it, but the channel is too narrow to be recommended, except in a case of extremity, and the mark for it can only be distinguished in clear weather,

**GOLDMER GAT**, the passage between West rocks and the north-east end of the Gunfleet, and connecting the Wallet and East Swin, is often used by vessels in easterly and westerly gales seeking the shelter of West rocks or the Gunfleet. Its breadth is about  $1\frac{1}{2}$  mile, over a considerable portion of which there are from  $4\frac{1}{2}$  to 6 fathoms, decreasing towards the shore; the spherical buoy, *striped horizontally black and white*, with *staff and diamond*, upon the north-east end of the Gunfleet, marks the channel to the south-west.

**Anchorage**.—The best anchorage within the gateway in heavy weather is with the Naze tower bearing N.  $\frac{3}{4}$  E., and Clacton church W. by N.  $\frac{3}{4}$  N.; here there is protection with the wind from West, round northerly, to S.E., which is partly afforded by the Gunfleet abreast drying at half-ebb.

**DIRECTIONS**.—The leading mark is Walton hall, well open north of Naze tower, bearing N.W.  $\frac{3}{4}$  W. In working, the Naze tower and Walton hall in line, N.W., will clear the Gunfleet in 20 feet; and the new mill, in line with the south end of the terrace of Walton-le-Soken, bearing N.W. by W.  $\frac{3}{4}$  W., will clear West rocks.

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## POSITIONS OF BUOYS.

## INNER GABBARD BUOYS.

**North Inner Gabbard Buoy.**—A *can* buoy, *chequered red and white with staff and cage*, lies in 10 fathoms on the north-west side of the Inner Gabbard, with Outer Gabbard Light-vessel, E.  $\frac{1}{8}$  N.  $5\frac{3}{8}$  miles ; South Outer Gabbard buoy, S.E.  $\frac{1}{8}$  E.

**South Inner Gabbard Buoy.**—A *can* buoy, *chequered red and white*, lies in 10 fathoms westward of a depth of 5 fathoms at the southern end of the sand. From it Outer Gabbard light-vessel bears N.E. by E.  $\frac{5}{8}$  E., distant  $9\frac{3}{10}$  miles ; South Outer Gabbard buoy E. by N.  $\frac{1}{8}$  N.

**Middle Inner Gabbard** is a *can* buoy, painted *red and white in vertical stripes*, in 10 fathoms, with Orfordness lighthouse N.W.  $\frac{7}{8}$  N.,  $15\frac{1}{4}$  miles ; Outer Gabbard light-vessel E. by N.  $\frac{1}{8}$  N.

## OUTER GABBARD BUOYS.

**North Outer Gabbard Buoy.**—*Conical red*, in 10 fathoms, lies eastward of the  $4\frac{3}{4}$  fathoms patch at the northern end of the sand. From it the Outer Gabbard light-vessel bears N.E.  $\frac{1}{2}$  E., distant  $7\frac{1}{2}$  cables, and the North Inner Gabbard buoy W.  $\frac{1}{4}$  N.

**South Outer Gabbard Buoy.**—A *conical red automatic signal* buoy is moored in 12 fathoms south eastward of the 5 fathoms patch at the southern end of the sand. From it the Outer Gabbard light-vessel bears N.E.  $\frac{1}{2}$  N., distant  $3\frac{1}{2}$  miles, and North Inner Gabbard buoy N.W.  $\frac{7}{8}$  W.

## GALLOPER SHOAL BUOYS.

**North Galloper** is a large *spherical* buoy, *striped black and white horizontally*, with *staff and diamond*, off the north end of the Galloper in 14 fathoms ; with Galloper light-vessel bearing S.W., distant  $4\frac{1}{2}$  miles ; Long sand light-vessel, W. by N.,  $11\frac{3}{4}$  miles. These bearings and distances place the buoy in lat.  $51^{\circ} 49' N.$  long.  $1^{\circ} 59' E.$



**Watch Buoy.**—A *black can* watch buoy lies in 8 fathoms near the south-west extremity of the shoal, S.E., three-quarters of a mile from the light-vessel.

### LONG SAND BUOY.

A *black bell* buoy, with *staff* and *St. Andrew's cross*, lies in 7 fathoms on the north-east extremity of the Long sand, with Walton hall open to the northward of the Naze tower, N.W.  $\frac{1}{2}$  W.; and Long sand light-vessel E.  $\frac{1}{4}$  N., 2 miles.

### KENTISH KNOCK BUOYS.

**North Knock** is a *red conical* buoy with *staff* and *globe*, in 7 fathoms, at the north-east extremity of the sand; from it, the light-vessel bears S. by E.  $\frac{1}{4}$  E., distant  $3\frac{4}{10}$  miles; and Long sand-head buoy, N.  $\frac{3}{4}$  E.,  $4\frac{3}{4}$  miles.

**Middle Knock** is a *red conical* buoy, in  $10\frac{1}{2}$  fathoms, half a mile from the south-east part of the sand; with North Knock buoy bearing N. by E.  $\frac{1}{2}$  E., distant  $4\frac{2}{3}$  miles; Kentish Knock light-vessel, N.E. by E.  $\frac{1}{4}$  E.,  $2\frac{1}{2}$  miles.

**South Knock** is a *red conical* buoy of large size, with *staff* and *globe*, outside the south-west extremity of the sand; it has K.K. marked upon it, and lies in 12 fathoms; with Minster mill open to the right of Margate church tower, S.W.  $\frac{1}{3}$  W.; and Tongue light-vessel W. by S.  $\frac{1}{3}$  S.,  $10\frac{2}{3}$  miles.

Two watch buoys also lie near the sand, the one a *black can*, in  $11\frac{1}{2}$  fathoms, W.N.W.,  $\frac{4}{10}$  mile from the light-vessel; and the other a *red nun*, in 7 fathoms, at the south-west extremity of the sand, N.N.W.  $\frac{1}{2}$  W.,  $1\frac{2}{10}$  miles from South Knock buoy.

### WHITING BANK BUOYS.

**N.E. Whiting** is a *red and white horizontally striped spherical* buoy, with *staff* and *diamond*, in  $3\frac{1}{2}$  fathoms, at the north-east extremity of the shoal; with Orford west windmill open to the westward of Orford church, N.  $\frac{7}{8}$  W.; and Martello tower (T), near Woodbridge haven, just open of Bawdsey cliff, W. by S.  $\frac{3}{4}$  S.

**Hook of Whiting** is a *red and white vertically striped can* buoy, in 3 fathoms, W.S.W., one mile from N.E. Whiting buoy; with

Orfordness lighthouse, bearing N.E.  $\frac{3}{4}$  E.; and Orford west windmill three times its width open of the west side of Orford castle, N. by E.

**S.W. Whiting** is a *red and white chequered can* buoy, in  $4\frac{1}{4}$  fathoms, at the south-west extremity of the shoal, S.W.  $\frac{1}{2}$  W.,  $1\frac{9}{10}$  mile from Hook of Whiting buoy; with Boyton windmill and hall in line, bearing N. by W.  $\frac{1}{8}$  W., and Orfordness lighthouse, N.E.  $\frac{1}{2}$  E.

### BAWDSEY BANK BUOYS.

**N.E. Bawdsey** is a *black conical* buoy in  $4\frac{1}{2}$  fathoms, upon the Bawd head or north-east end of the sand; with the south side of the tower of Bawdsey church touching the north side of Martello tower (X) to the north-eastward of Bawdsey cliff, bearing W. by N.; and Orfordness lighthouse, N. by E., distant  $3\frac{8}{10}$  miles.

**S.W. Bawdsey** is a *spherical* buoy, with *black and white horizontal stripes*, surmounted by a *staff and two triangles*, in  $6\frac{1}{2}$  fathoms; with Hollesley church in line with the eastern Martello tower (AA) below Bawdsey, bearing N. by W.  $\frac{1}{3}$  W.; and the west end of Bawdsey cliff, N.W.  $\frac{3}{4}$  W.

### SHIPWASH BUOYS.

**North-west Shipwash.**—A *can* buoy, painted *black and white in vertical stripes* lies in 8 fathoms, with Orford west mill open west of Orford church, N. by W.; Falkenham church, in line with right end of Bawdsey cliff, W.N.W.

**Middle Shipwash** is a *can* buoy, *chequered black and white*, in 9 fathoms, close to the inner side of the sand; with Bawdsey church, in line with Martello tower (W), bearing N.W.  $\frac{1}{3}$  W.; and Orfordness lighthouse N.  $\frac{3}{4}$  E.

**South Middle Shipwash** is a *can* buoy painted in *black and white vertical stripes*, in  $6\frac{1}{2}$  fathoms, to cover the knuckle in the sand; with Middle Shipwash buoy bearing N.E.  $\frac{1}{2}$  N., distant  $2\frac{4}{10}$  miles; and Rough buoy, W.  $\frac{1}{4}$  N.,  $3\frac{9}{10}$  miles.

**S. W. Shipwash** is a *spherical* buoy, *striped horizontally black and white*, with *staff and triangle*, in 6 fathoms on the south-west end of the sand, with Harwich spire open a distance equal to its apparent height to the northward of Landguard fort, bearing N.W.  $\frac{3}{4}$  W.;

and Orfordness lighthouse under the east end of Vernal's wood, N. by E.  $\frac{3}{4}$  E.

**East Shipwash** is a *black conical* buoy on the eastern side of the sand, in  $12\frac{1}{2}$  fathoms; with Alderton mill open east of the third Martello tower (Y) north-east of Bawdsey sea-mark, bearing N.W.  $\frac{1}{3}$  W.; Shipwash light-vessel, N. by E., distant  $3\frac{1}{10}$  miles.

**N.E. Shipwash** is a *black conical* buoy, with *staff and two globes*, in 10 fathoms, half a mile eastward of the shoal patch at the north-east end of the sand. From it Shipwash light-vessel bears N.N.W.  $\frac{1}{4}$  W., distant  $8\frac{1}{2}$  cables, and East Shipwash buoy S.S.W. (southerly), distant 3 miles.

#### CUTLER BUOY.

**Cutler Buoy.**—A *red conical* buoy lies in  $4\frac{1}{2}$  fathoms, half a mile to the southward of the south-west tail of the Cutler; with Orfordness lighthouse bearing N.E.  $\frac{2}{3}$  E.; and the Martello tower (P) on Landguard east beach, appearing between Harwich lighthouses, W.  $\frac{2}{3}$  N.

#### LOWER ROUGH BUOY.

**Lower Rough Buoy.**—A *spherical* buoy, striped *horizontally red* and *white*, lies in  $3\frac{1}{2}$  fathoms, near the south end of the shoal portion of the Lower Rough; with Alderton rectory appearing midway between Alderton windmill and Bawdsey sea-mark, bearing North; and Harwich spire in line with the middle of Landguard fort, N.W.  $\frac{3}{4}$  W.

#### WOODBIDGE HAVEN BUOY.

A *red conical* buoy, marked W.E. Haven, lies in 3 fathoms outside Woodbridge haven knolls, with Ramsholt church, just open of the south-west end of Bawdsey cliff, bearing N. by W.; and the Martello towers (W) and (X) in line, N.E.  $\frac{1}{8}$  E.

#### FELIXSTOWE LEDGE BUOY.

A *red conical* buoy is placed in  $3\frac{1}{2}$  fathoms on the outer part of Felixstowe ledge, with Martello tower (W) north-east of Bawdsey sea-mark appearing between towers (X) and (Y); N.E.  $\frac{1}{2}$  N. and Dovercourt church, in line with the flagstaff of Landguard fort, W. by N.

## HARWICH HARBOUR BUOYS.

**Platters** is a *red conical* buoy, in 3 fathoms, on the south-eastern side of the shoal, with the western Martello tower at Woodbridge haven, just open of Felixstowe cliff, bearing N.E.  $\frac{1}{4}$  N. ; and Erwarton church, over the high red-tiled storehouse in Harwich dockyard, N.W.

**Andrews** is a *red conical* buoy, in 22 feet, at the south-east extremity of the shoal, with the S.E. leading beacon on Landguard point, in line with the east side of Walton Martello tower, bearing N.  $\frac{1}{2}$  W. ; Erwarton church, touching the north side of Harwich old high lighthouse, N.W.  $\frac{1}{4}$  N.

**Beach-End**, the extremity or toe of Landguard point, is marked by a *red bell* buoy, in 3 fathoms, with Walton east windmill in line with the boathouse on Landguard beach, bearing N.E.  $\frac{3}{4}$  N. ; and Dovercourt high lighthouse open its width to the northward of the low lighthouse, N.W. by W.  $\frac{3}{4}$  W.

**Inner Ridge** is a *can* buoy with *red and white vertical stripes*, lying in 15 feet, with the east end of Wadgate grove, over the centre of Martello tower (Q) on Bull cliff, bearing N.N.E.  $\frac{1}{2}$  E. ; and Dovercourt high lighthouse, its width open to the southward of the low lighthouse, N.W. by W.  $\frac{1}{3}$  W.

**Outer Ridge** is a *chequered red and white can* buoy, in 15 feet, at the southern end of the shoal, with the northern Martello tower at Woodbridge haven, just open of the north-east end of Felixstowe cliff, bearing N.E.  $\frac{1}{2}$  N. ; and Erwarton church, in line with the beacon at the end of the breakwater, N.W.  $\frac{3}{4}$  N.

**Cliff-foot** is a *can* buoy, chequered *red and white*, and surmounted with a staff and cage, in 18 feet, N.W. 2 cables from Beach-end buoy. From it Harwich church spire appears just East of the old low lighthouse, N. by W.  $\frac{1}{2}$  W. Lighthouse on Landguard point N.E. by E.  $\frac{1}{2}$  E.

**North Cliff**, *can, striped vertically red and white*, in 18 feet, N. by E.  $\frac{3}{4}$  E., 4 cables from Cliff-foot buoy.

**South Shelf**, *chequered red and white can*, in 16 feet, N. by E.  $\frac{1}{4}$  E.,  $3\frac{1}{4}$  cables from North Cliff buoy.

**North Shelf**, *can, striped vertically red and white*, in 16 feet, N.  $\frac{1}{4}$  E., 4 cables from South Shelf buoy.

**Guard**, a *chequered red and white can* buoy, with staff and cage, in 24 feet, N.W.  $\frac{1}{4}$  N., 4 cables from North Shelf buoy.

The above four buoys, as well as that upon Cliff-foot rock, must be left on the port hand in entering.

**Shotley Spit**, a *spherical* buoy, with *red and white horizontal stripes*, in 16 feet, marks Horse bank at the extremity of Shotley point.

**Stone Bank Buoy**.—For the use of vessels passing through Medusa channel, of which Stone banks are the eastern boundary, a *can* buoy, with *red and white vertical stripes*, lies at the south-west part of the Stone banks, in 15 feet at low water; with Harwich church, appearing between Harwich old lighthouses, bearing North; Naze tower, W. by S.  $\frac{1}{4}$  S.

**Cork Sand Buoy**.—A *can* buoy, with *red and white vertical stripes*, lies on the north-east end of Cork sand, in  $3\frac{1}{2}$  fathoms; with Martello tower (T) at the entrance of Woodbridge haven, its width open to the right of Ramsholt church, bearing North; Harwich church, open to the left of Landguard fort, N.W.  $\frac{2}{3}$  W.

**West Rocks Buoy**.—West rocks are marked to the south-eastward by a *black conical* buoy, in  $3\frac{3}{4}$  fathoms, with Harwich old high lighthouse, open its width to the westward of the old low lighthouse, bearing N.N.W.  $\frac{3}{4}$  W.; and the Naze tower, W.N.W.

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## CHAPTER VIII.

## THAMES ESTUARY.—PART. II.

## NAZE TO THE NORE.

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 VARIATION 16° 50' West, in 1889.
 

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This chapter, in continuation of last, which described the outer banks of the Estuary and the sand banks from Orfordness to the Naze, contains a description of the northern channels to the Nore. To avoid a break in the text, the *positions* of the buoys are given at the end of this chapter.

The frequent casualties on the sands in the Thames Estuary have caused the Trinity house to adopt the following signals on board the light-vessels, and at the lighthouses, to facilitate the diffusion of the intelligence of a vessel being in distress, and of the locality of the mishap.

In order to communicate that a vessel is on either of the under-mentioned sands, the arranged signal will be fired from the light-vessel or pile lighthouse, and repeated until answered from an inner light-vessel, a coast guard station, or a life boat at the vessel indicated.

Sands.	Signal.	Interval of firing.	To be repeated every
Kentish Knock and south-west part of Long sand.	One gun and one rocket.	—	Ten minutes.
North-east part of Long sand and Sunk.	Two guns and two rockets.	Five seconds.	Ten minutes.
Gunfleet and Cork ... ..	Two guns and two rockets.	Twenty seconds.	Ten minutes.
Shipwash, Whiting, and Bawdsey.	One gun and one rocket.	—	Five minutes.
Sands westward of line joining Maplin and Girdler.	Two guns and two rockets.	Thirty seconds.	Ten minutes.
Sands eastward of line joining Maplin and Girdler.	Two guns and two rockets.	Two minutes.	Fifteen minutes.
Goodwin and Brake ... ..	One gun and one rocket.	—	Five minutes.

Two guns and two rockets fired from a light-vessel at intervals of five minutes, and repeated every fifteen minutes, indicates she requires assistance, or that assistance is required by a vessel not on the sands mentioned above.

**The WALLET**, a broad channel between the Gunfleet sand (described on page 304), and the shore of Essex,\* beginning abreast the Naze and ending abreast the Colne, is 12 miles long, with a breadth of about 4 miles at its eastern end and 3 miles at its western end. The rivers Colne, Blackwater, and Crouch discharge themselves into its upper end, and it is the direct route to those rivers. It is cut off from the northern main channel into the Thames by the Gunfleet, Buxey, and Ray sands, but there is a spitway, or swatchway, of 9 feet at low-water between the Gunfleet and Buxey shoals, useful to small vessels. It is commonly used by vessels bound to Colchester or Maldon, and by those pursuing an in-shore coasting track, who find an outlet by the Spitway.

**The COAST.**—Cliff continues from Walton-le-Soken to the south-west; at the distance of  $1\frac{1}{2}$  mile, and near its brink, are Frinton Hall farm and Frinton chapel, the latter a small ruined building with a belfry partly overgrown by ivy; then, for the same distance, the shore is low, and backed by an undulating country. On the highest part of it, Great Holland church, with a square tower and surrounded by wood, is prominent.

**CLACTON-ON-SEA.**—Beyond the low shore just noticed, there is cliff for 3 miles; the eastern portion of which is known as Holland cliff, and that to the westward as Clacton cliff; Clacton-on-Sea, and Martello tower, No. 6,† stand upon the latter; Clacton church with a stunted spire, and the high tower of Clacton waterworks, are behind.

**Pier and Light.**—A pier extends out from Clacton-on-Sea, its head being marked by a *fixed red* light. In the summer four additional lights are shown on the pier, one in the centre and three at the outer end of the structure.

**A Life-Boat** is also stationed here.

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\* See Admiralty chart of the river Thames, sheet 1, Kentish Knock and the Naze to West Swin, No. 1975; scale, mile = 1·4 inch. Also, England, East coast, North Foreland to Orfordness, including the entrance to the Thames, No. 1610; scale, mile = 0·5 inch.

† The numbers of the Martello towers are for reference in the first of the above charts.



From Clacton cliff, low beach extends to the mouth of the Colne with Martello towers occurring at intervals along it. The village of St. Osyth, with its ruined priory, Brightlingsea church with a tower, and chapel with a spire, are all marked objects on the well-wooded background.

**MERSEA ISLAND**, situated between the mouths of the rivers Colne and Blackwater, 4 miles in length, is low and wooded; the tower of East Mersea church, with a turret at one corner, and that of West Mersea church, a plain white-washed structure show conspicuously near the east and west extremities of the island. Near the south-west point of the island Roman pavements and foundations may yet be seen.



East Mersea church.



West Mersea church.

**SALES POINT**, on the south side of the entrance to the river Blackwater is low; the ruined chapel of St. Peter stands one mile to the southward of it; the remainder of the shore to Shoeburyness consists of low embanked lands, scarcely visible from the main navigable channel abreast.

**SHOALS**.—The bottom of the Wallet shelves irregularly from the shore to the north-west side of the Gunfleet (which is unbuoyed), and it is in general foul for nearly one mile off shore; the following shoal patches occur:—

**COPPERAS GROUND**, with 8 to 11 feet upon it, lies one mile out from Frinton chapel. The Naze tower, bearing N. by E.  $\frac{3}{4}$  E., and No. 6 Martello tower, West, clears its south-eastern and south sides.

**TRIPOD**, abreast the middle of Clacton cliff, and three-quarters of a mile off shore, is a small bank of shingle with 6 feet upon it.

Holland gap, formed between Holland and Clacton cliffs, bearing N.  $\frac{3}{4}$  E., clears its east side; and the Marsh tree (round and prominent), standing between Lion point and Eastness, kept open to the westward of No. 4 Martello tower, bearing W. by N.  $\frac{3}{4}$  N., will lead to the southward of it.

**RUNCH**, abreast Eastness,  $1\frac{3}{4}$  miles off that point, and S.W.,  $1\frac{3}{4}$  miles from the Tripod, lies nearly midway across the Wallet; it is



only 2 cables in length, with from 16 to 18 feet upon it, and 20 to 24 feet about it.

**COLLIER** is also abreast Eastness, being two-thirds of a mile from the shore and within the Runch ; it consists of one large and several small patches, 4 cables in extent, with 4 feet least water upon them, Clacton water works tower on with Martello tower No. 6, bearing North, and Colne point, N.W. by W.  $\frac{3}{4}$  W., clear it to the eastward and south-westward.

**PRIORY SPIT**, the outer extremity of the foul ground projecting between Eastness and Colne point, with 9 to 11 feet upon it, is  $1\frac{1}{2}$  mile to the eastward of the entrance to the Colne, and nearly midway between the Collier and Eagle. When abreast it, the tower of St. Osyth priory and Martello tower No. 3 will be in line, bearing N.  $\frac{1}{2}$  W. East Mersea church, kept open of Colne point, N.W., clears its south-west side. Its outer extremity is marked by a *red conical* buoy.\*

There are several other patches at the head of the Wallet, but as they are at the entrances of the rivers Colne and Blackwater they will be fully described subsequently, page 300 ; the anchorage at the head of the Wallet, known as Swire hole, is described on page 310, and the channel from Swire hole into the river Crouch on page 310.

**SPITWAY**, the passage connecting the western or upper end of the Wallet with the East Swin, 12 miles from Goldmer gat, and abreast of, and  $3\frac{1}{2}$  miles from Eastness, passess between the Gunfleet and the Buxey, and is three-quarters of a mile through, with 9 feet at low-water springs in the middle of the channel.

**BUOYS**.—The Spitway is marked by a *spherical buoy*, painted in *red* and *white* horizontal bands on its north side, and by a *black conical* bell buoy on its south side.\*

**DIRECTIONS for the Wallet and Spitway**.—As the obstructions in the Wallet lie for the most part within one mile of the shore few directions are necessary. Keep  $1\frac{1}{2}$  miles off, and, if working, in standing towards the Gunfleet tack on the first shoal cast, as that sand is steep-to. From abreast the Naze, the course up the Wallet is, first S.W. by W.  $\frac{1}{4}$  W., and then W. by S.  $\frac{1}{2}$  S., but the former course should be continued if bound through the Spitway. In passing through the latter channel keep a short distance to the eastward of the buoys, but should they be out of position, St. Osyth church well

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\* For positions of buoys, see p. 314.

open to the eastward of No. 3 Martello tower will lead through. In passing through the Spitway from the Swin, the Wallet will have been entered when the Naze tower becomes shut in upon Frinton cliff, and a course may then be shaped for Colne bar or the body of the Wallet.

**CAUTION.**—The flood-stream sets strongly across the north-east end of the Gunfleet into the Wallet, and W.N.W. through the Spitway, but more northerly during the latter part of the tide. The ebb-stream sets obliquely across the inner side of the Gunfleet.

**Anchorage.**—Besides the shelter afforded by West rocks in easterly gales (as noticed on page 288), there is also well-sheltered anchorage in every part of the Wallet in gales off-shore, as well as in those from S.W. to S.E. ; for the high sands which bound it intercept all weighty sea, and it becomes comparatively smooth at two hours' ebb. The precaution should, however, be adopted of giving a good scope of cable on first taking up a berth, for, as the bottom is stiff clay, the anchors become shod, and will seldom hold again after they have once started.

**RIVER COLNE** rises in the north-west part of Essex, and after a course of 32 miles, the latter portion of which is, for several miles, between extensive flats and detached banks, joins the sea near Colne point. Many obstructions exist in it ; the tide is nearly throttled by the overlapping projections, Hound point and Ooze end, and the navigable state of the river has been considered subordinate to the purposes of the oyster fishery, the outer limits of which are Colne point and Rams hard, the latter  $2\frac{1}{2}$  miles above Brightlingsea. The oysters are deposited on the bed of the stream, and the result has been that the river has materially lost in depth, and vessels are frequently detained in consequence.

**BRIGHTLINGSEA**, which is connected by a branch line with the Great Eastern railway, is a short distance up a creek of the Colne opposite the east end of Mersea island. It is known as the headquarters of numerous small fore-and-aft vessels engaged in the oyster fishery, dredging for cement stone, and in the salvage of vessels which have been wrecked in the East and West Swins. It has a small trade about 300 vessels, exclusive of the smacks, entering annually. There are two patent slips, capable of taking up vessels of 10 to 13 feet draught. Population about 4,000 in 1881.

**WIVENHOE**, upon the left bank of the Colne, 3 miles below the

Hythe, may, from its superior facilities, be considered the port of Colchester ; vessels drawing 15 feet being able to reach it on spring tides. Moorings are laid down for twelve single berths, where vessels discharge into lighters ; the bottom is mud and gravel, but nearer the town it is hard.

**Supplies** of all kinds may be readily obtained here, including good spring water. Several noted yachts have been built in a yard at the upper end of the town.

**COLCHESTER**, upon the right bank of the Colne, 8 miles above Brightlingsea, dates from a very early period, having been among the first of the Roman settlements, and it was celebrated during several centuries for the manufacture of baize and serge, originally established by some expatriated Flemings, but this branch of industry decayed, and is now extinct ; the general trade of the port has also suffered from various causes.

The usual shipping place is named the Hythe, and vessels drawing 11 feet can reach it at spring tides. A branch of the Great Eastern railway was led down to it in 1848. Several schemes have been proposed for converting this portion of the Colne into a floating basin, and improvements have been carried out, several points which obstructed the tidal flow having been cut off and the channel deepened below the Hythe.

Colchester imports timber, and exports corn and malt ; 229 vessels, of 8,427 tons, belong to it, besides numerous smaller craft sailing from Rowhedge, Wivenhoe, and Brightlingsea ; but its trade is comparatively unimportant. One shilling is levied by the Corporation of Colchester on each vessel anchoring in the Colne. Population, 28,395 in 1881.

**Pilots.**—There are four licensed pilots for the Colne, who board at Mersea point, and fishermen well acquainted with its pilotage may also be procured by hoisting the usual flag.

**SHOALS at the ENTRANCE to the RIVER COLNE.**—The entrance to the Colne is between the following detached banks and shoals :—

**KNOLL** is a long narrow ridge on the north-east side of Dengie flat, which fills up the whole of the space between the Blackwater and Crouch. The Knoll is very shallow throughout, and a portion of it dries one foot. It is marked by two *can* buoys, painted with *red and white* vertical stripes.\*

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\* For positions of buoys, *see* p. 315.

**EAGLE** is half a mile to the northward of the outer extremity of the Knoll ; between them is the principal entrance into the Colne. The Eagle is  $1\frac{1}{2}$  miles long in a W. by N.  $\frac{1}{2}$  N. and E. by S.  $\frac{1}{2}$  S. direction, and half a mile broad ; its west end is very shallow, one part drying ; the depths over the remaining portion vary from 2 to 12 feet. It is marked by a *red conical* buoy on its south-west side, and a *chequered red and white can* buoy on its north-east side.\*

**COLNE BAR** extends S.  $\frac{3}{4}$  W. for  $1\frac{1}{2}$  miles from Colne point, and is separated from the Eagle by a channel one-third of a mile wide, named Eagle deep. The bar has an average depth of 2 to 5 feet, with some dry patches near to Colne point. It is marked at its outer end with a *red conical* buoy.\*

Traders to and from Colne river usually pass over Colne bar shoal when there is a sufficient flow of tide, and hence this obstruction has obtained among them the inaccurate name of Colne bar.

**BENCH HEAD** is on the opposite side of the river, abreast Colne point, being the outer point of Mersea flat, a dry and shallow track caused by the confluence of the Colne and Blackwater. The shoal extends about S.S.W. for one mile, and then S.W. by W. for 4 cables, and has from one to 6 feet upon it, while there are 7 and 9 feet on the flat about it. It is marked on its south extremity by a *spherical* buoy, painted in *red and white* horizontal stripes, and on its eastern side by a *white can* buoy.

The channel proper of the river Colne is between the Bar and Bench head shoals ; it is on an average about 2 cables wide, and the least depth at low water is 12 feet.

**DIRECTIONS.**—The passage into the Colne between the Eagle and the Knoll bears N.W.  $\frac{3}{4}$  W.,  $2\frac{3}{4}$  miles from near Wallet Spitway buoy, and has an irregular width of 3 to 4 cables, with depths from 9 to 14 feet. The leading mark through is Barn hall (a house standing high upon the outline), in line with the west point of Mersea island, bearing N.W.  $\frac{1}{2}$  W. ; but as Barn hall is a very distant object, and can be seen only in clear weather, the buoys will be the best guide. Pass in mid-channel between them, keeping the *can* buoys to the south-westward, and the *conical* buoy on the Eagle to the north-eastward ; when through, the water quickly deepens to 6 and 7 fathoms, and the *conical* Bar buoy will bear N.N.W.  $\frac{1}{4}$  W. three-quarters of a mile. If entering to the northward

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\* For positions of buoys, see p. 315.

of the Eagle, East Mersea church, open of Colne point, bearing N.W., leads between the Eagle and Priory spit, and when the water deepens, keep away to the westward till Martello towers Nos. 4 and 6 appear in line, bearing about E. by N.  $\frac{3}{4}$  N., which is the leading mark through Eagle deep, and round southward and westward of the *conical* Bar buoy.

From abreast the Bar buoy, the leading mark into the Colne up to as far as the *white can* (fishery) buoy near the inner part of Bench head, is, Brightlingsea church, in line with, or just to the eastward of, Martello tower No. 1, bearing N.  $\frac{3}{4}$  E.; it passes over a tail of 12 feet at low-water.

The mid-channel mark from Bench head to Mersea island is, Wivenhoe mill, in line with the gap in Aldborough wood, bearing N.  $\frac{1}{2}$  W. As above remarked, a 12-feet shoal lies in the fairway.

Working into or out of Colne river, Brightlingsea church must only be brought in line with Martello tower No. 1, while standing to the westward, and very little open when standing to the eastward, as the channel is but one-quarter mile wide.

**Anchorage** may be taken up abreast the mouth of Brightlingsea creek.

**TIDES.**—It is high-water, full and change, at Colne point, at 12 o'clock, and at Wivenhoe at 0h. 10m.; at Colne point springs rise 14 feet, neaps 10 feet, and neaps range 6 feet; while at Wivenhoe they rise 15 and 10 feet, respectively, and the range of neaps is 5 feet.

**BLACKWATER**, having a common outlet with the Colne, rises in the north-west corner of Essex. At Maldon, 32 miles below its source, it is joined by the Chelmer, and then enters a broad estuary, the outlet of which is 10 miles lower down abreast Mersea island. For 5 miles above Sales point on the south side of the entrance, the low-water capacity of the Blackwater is considerable; the channel then becomes narrow and tortuous, and the upper part of the estuary is nearly wholly occupied by broad flats, and Osea and Northy islands.

**MALDON**, upon the right bank of the Chelmer at its junction with the Blackwater, is, like Colchester, of great antiquity, and probably had a similar origin. Its earliest records bear the date of 913, when King Edward encamped near it to oppose the Danes.

Maldon had a fair trade up to 1794, when a canal was formed to connect Collier reach,  $1\frac{1}{2}$  miles below the town, with the Blackwater at Heybridge, which had the effect of diverting the trade to the

latter village. The basin of the canal is three-quarters of a mile long ; the gates are 26 feet wide, and vessels of 12 feet draught enter it during springs ; they discharge their cargoes into barges of 25 tons burden for conveyance into the interior.

Maldon is connected by railway with Chelmsford. 140 vessels of 8,583 tons belong to the port (including Burnham), and those drawing 9 feet reach it on spring tides. The trade is of a similar character to that of Colchester. In 1880 the arrivals were 3,555 vessels of 162,066 tons. Population, 5,476 in 1881.

**DIRECTIONS.**—The directions for the Colne (pages 301, 302) are applicable to the Blackwater to as far as the Bar and Knoll buoys ; thence the Blackwater extends north-westerly to as far as Sales point. No mid-channel mark can be given, but, when working, tack on Mersea flat side before Barn hall becomes shut in over the west end of Mersea island, and when that mark is no longer of any use, tack when Tollesbury church appears in line with the packing house (a small wooden shed standing upon Shingle point), bearing W. by N.  $\frac{3}{4}$  N. No marks can be given for the Knoll side of the channel, but it is necessary to remember that the flood stream sets outward across the outer end of the Knoll, and inward across its inner end.

**Pilots.**—Having arrived above Sales point, anchor and procure a pilot. There are six licensed pilots, but they do not go lower down than Osea island, except in answer to signal.

**TIDES.**—It is high water, full and change, at Sales point, at 12h. 0m. ; at Heybridge haven, at 0h. 20m. ; and at Maldon, at 0h. 32m. Springs rise  $14\frac{3}{4}$  feet at Sales point, 12 feet at Heybridge basin, and 10 feet at Hythe wharf, Maldon. Neaps rise 10 feet, 8 feet, and 6 feet ; and range  $5\frac{1}{4}$  feet, 4 feet, and 2 feet, respectively.

### EAST SWIN.

The East Swin, or King's channel, the lower portion of the north-eastern channel through the Thames estuary towards the Thames, begins abreast the north-eastern end of the Gunfleet, and ends at the Middle light-vessel and Whitaker beacon ; the channel passes between extensive sand-banks, and, as the shore is distant and low, and no sailing marks can be given, the navigation depends upon artificial marks, combined with correct courses and distances, and a careful attention to the set of the tidal streams.

The East Swin, which in its general direction extends W. by S.  $\frac{1}{4}$  S.



and E. by N.  $\frac{1}{4}$  N., for 16 miles, narrows from a width of more than 3 miles at the north-eastern end to one mile at the south-western end. It is bordered on the north-western side by the Gunfleet sand and Whitaker spit, and on the south-eastern side by the Sunk and Middle sands. The channel is marked by a light-vessel at each end (The Sunk) and the (Swin Middle), and by *conical* buoys on the starboard side, in entering, and *can* buoys on the port side.

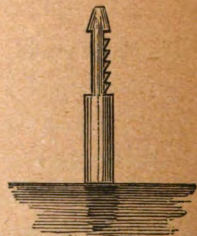
**GUNFLEET SAND**, beginning with the Naze tower bearing N.W., distant  $5\frac{1}{4}$  miles, extends S.W. by W.  $\frac{1}{2}$  W. for 3 miles, and then W. by S.,  $8\frac{1}{2}$  miles to the Spitway, is about  $1\frac{1}{2}$  mile across at its broadest part. The main body of the sand dries at low-water 2 to 4 feet. It is marked on its south-eastern side by a pile light-house and four *black conical* buoys, and at its north-east extremity is a *spherical* buoy painted in *black* and *white horizontal bands*, and surmounted with a *staff* and *diamond*.\*

**GUNFLEET LIGHTHOUSE**, near the south-east elbow of the Gunfleet, where the direction of that side of the sand changes from S.W. by W.  $\frac{3}{4}$  W. to W.  $\frac{3}{4}$  S., is built upon screwed piles, and shows a *red light revolving every half-minute*, at 41 feet above the water, which may be seen in clear weather from a distance of 11 miles. A berth of half a mile should be given it.

**Fog Signal**.—A bell is sounded during thick or foggy weather *once every ten seconds*.

**WHITAKER SPIT**, the north-eastern extremity of Foulness sand, is about 2 miles to the south-west of the Spitway or Swatchway, between the Gunfleet and Buxey sand, described at page 298, and is separated from the Buxey by Whitaker swatchway, or channel, leading towards the river Crouch. The spit is marked at its north-east extremity by a *spherical* buoy, painted in *black* and *white horizontal bands*, and surmounted by a *staff* and *diamond*.\*

**Whitaker Beacon** (placed in 1839) is W.S.W.,  $1\frac{3}{4}$  mile from Whitaker buoy, and N. by E.  $\frac{2}{3}$  E.,  $1\frac{1}{10}$  miles from Swin Middle light-vessel; it is 40 feet high, *black*, and fitted as a life-beacon. From it, Great Clacton church and mill appear in line with Martello tower No. 6, bearing N.N.E.  $\frac{2}{3}$  E.; and Bridgewick farm, midway between Southminster church and the west mill, W. by N.  $\frac{2}{3}$  N.



Whitaker beacon.

\* For positions of the buoys, see the end of this chapter, page 315 & 316.



Whitaker beacon is the divisional mark between East and West Swins.

**SUNK**, the north-easternmost danger on the south-east side of East Swin, is an extensive shoal lying in a direction nearly parallel to Long sand, from which it is separated by Black deep, a channel 2 miles across. The Sunk is 15 miles long,  $1\frac{1}{2}$  miles broad steep-to on both sides, and broken up into patches, which dry in several places at low-water, that on the Great Sunk to  $4\frac{1}{2}$  feet.

The north-east extremity of the Sunk is S. by E., 4 miles from Gunfleet N.E. buoy, and W.  $\frac{1}{2}$  N., 5 miles from Long sand buoy. At its north-east extremity it is marked by a *can* buoy, *chequered black and white*, and on its north-western side by a *can* buoy painted in *black and white* vertical stripes. The two buoys bear from each other E.N.E. and W.S.W., the distance between them being  $4\frac{1}{2}$  miles.\*

**SUNK LIGHT-VESSEL** is moored in  $7\frac{1}{2}$  fathoms, 5 miles to the north-eastward of the north-east extremity of Sunk sand, to mark the entrance to the East Swin, as well as to serve as a guide to vessels rounding Long sand head. The light is a *revolving* light, showing flashes *every forty-five seconds*, alternately *red* and *white*, of nearly equal power ; it is 39 feet above the water, and visible at the distance of 11 miles in clear weather.

**TELEGRAPH CABLE.**—A submarine telegraph cable has been laid between the Sunk light-vessel and Walton-le-Soken (Walton-on-the-Naze). From the light-vessel the cable is laid in a W.N.W. direction, until within 2 miles of the Naze cliff, thence W. by N. to a position on the shore  $1\frac{1}{2}$  cables northward of the pier at Walton. Mariners are cautioned not to anchor on this line. The new mill in line with the south end of the terrace at Walton, bearing N W. by W.  $\frac{3}{4}$  W., will keep vessels southward of the cable.

**Fog Signal.**—A gong is sounded during thick or foggy weather.

By day the vessel carries a half ball over the usual ball at the mast-head. From her Kirby-le-Soken church appears westward of Walton terrace, the length of that terrace W. by N.  $\frac{3}{4}$  N., Harwich high light-house half open southward of the low lighthouse N.W.  $\frac{3}{4}$  N. ; West rocks buoy, N.W.  $\frac{3}{4}$  W., distant  $1\frac{9}{10}$  miles ; Rough buoy, N.  $\frac{1}{4}$  E.,

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\* For positions of the buoys, see the end of this chapter, pages 315 and 315.



3 $\frac{3}{4}$  miles; S.W. Shipwash buoy, N.E. by E.  $\frac{1}{2}$  E., 3 $\frac{1}{2}$  miles; Galloper light-vessel, S.E.  $\frac{1}{2}$  E., 17 miles; Long sand light-vessel, S.E., 7 miles; and Sunk-head buoy, S.S.W.  $\frac{1}{2}$  W., 5 miles.

**MIDDLE.**—Two sands, the Barrow and the Middle, occupy the space between the south-west end of the Sunk and Whitaker spit. Of the three channels thus formed, Barrow and Middle deeps are unbuoyed, and are therefore not used; the remaining channel, constituting the upper end of East Swin, is between Whitaker spit to the north-westward, and the Middle to the south-eastward. The lower or eastern end of the Middle (5 fathoms) is S.W. by W.  $\frac{1}{2}$  W., 12 miles from Sunk light-vessel, and S.W.  $\frac{1}{4}$  S., 5 $\frac{1}{10}$  miles from Gunfleet lighthouse; thence, bending to the westward, it extends W.  $\frac{3}{4}$  S. for 7 miles to its opposite extremity in a depth of 3 fathoms, from whence a narrow 4-fathom bar extends across the channel to the Foulness sand; it is only one-quarter of a mile broad, and steep-to on both sides, with but little water over it, there being several patches of 5 feet. The Middle is marked by 5 *can* buoys, painted *black* and *white*, on the north-west side; the north-eastern and south-western of the 5 buoys being each surmounted with a *staff* and *cage*.\*

**SWIN MIDDLE LIGHT-VESSEL** is moored in 5 $\frac{1}{2}$  fathoms,  $\frac{4}{10}$  of a mile to the northward of the western extremity of the Middle sand, and W. by S.  $\frac{1}{2}$  S., 2 $\frac{8}{10}$  miles from the North Hook buoy. The light is *white*, *revolving every half-minute*, at a height of 36 feet above the water, and may be seen in clear weather at a distance of 10 miles.

**Fog Signal.**—A gong is sounded during thick or foggy weather.

From the vessel, Whitaker beacon bears N. by E.  $\frac{3}{4}$  E., distant 1 $\frac{1}{10}$  mile; North Hook buoy, E. by N.  $\frac{1}{2}$  N., 2 $\frac{8}{10}$  miles; N.E. Maplin buoy, S.W.  $\frac{3}{4}$  S., 2 miles; Sunk light-vessel E.N.E., 19 miles; Maplin lighthouse, S.W.  $\frac{2}{3}$  S., 4 miles; and S.W. Middle buoy, S. by W., 5 $\frac{1}{2}$  cables.

**DIRECTIONS for East Swin.**—It has been remarked (on page 303) that, owing to the nature of the East Swin and its distance from the low shore abreast, great attention should be given to the courses and distances sailed, and to the sets of the tides, and also that the navigation of this channel depends entirely on artificial marks; but as it is well buoyed and lighted, there is little difficulty in using it in ordinary weather. Here as throughout the Thames, the starboard

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\* For positions of buoys, see pages 316 and 317.

side of the channel in entering is marked by *conical* buoys of *one* colour and the port side by *can* buoys of *two* colours.

Approaching East Swin at night, the Sunk light should not be brought to the southward of S.S.W. to clear the West rocks and Rough, nor to the northward of N.W. by N. to clear Long sand head.

Being abreast of, and half a mile to the north-westward of, Sunk light-vessel, steer S.W. by W.  $\frac{1}{4}$  W. for 8 miles, when Gunfleet lighthouse will bear N.  $\frac{1}{4}$  W., distant  $1\frac{1}{2}$  mile; then steer W. by S.  $\frac{1}{4}$  S. for  $8\frac{1}{2}$  miles, when Swin Middle light-vessel will bear S.W. by W.  $\frac{1}{2}$  W., westerly,  $2\frac{1}{2}$  miles, on which bearing she may be closed. At night, pass close to Sunk light, and keep it bearing N.E. by E.  $\frac{1}{2}$  E., until Gunfleet light has been brought to bear N. by W., then proceed as before. Gunfleet light will indicate the position of that sand.

In working, stand into 8 fathoms from the north-east end of the Gunfleet to Gunfleet lighthouse, and towards Sunk sand, until Sunk light-vessel bears N.E. When well above Gunfleet lighthouse, tack before it bears E.N.E. Above the Heaps buoy, East Swin being greatly diminished in width, do not bring the Middle light-vessel to the westward of W. by S.  $\frac{3}{4}$  S., nor to the southward of S.W.  $\frac{1}{2}$  W., until well up to her; the last-mentioned bearing just clears Whitaker spit, and leads to eastward of Swin spitway buoy.

At Swin Middle light-vessel the channel is less than one mile wide.

The directions for the West Swin and the description of that channel are continued on p. 310.

**CAUTION.**—Owing to the nature of the navigation in East Swin, and to a want of due caution, more wrecks have occurred in it than upon any other portion of the eastern coast.

Before the placing of Gunfleet light-vessel, which has been superseded by the pile lighthouse, the wrecks generally took place upon Gunfleet sand, about 3 miles to the westward of the lighthouse.

The establishment of Gunfleet lighthouse has, no doubt, prevented such frequent losses, but the principal causes of accidents are, gross neglect of the lead; not making sufficient allowance for the tide-set when running in strong south-easterly winds at the latter part of the flood, at which time the vessel is being set to leeward by both tide and sea; from vessels at the same period of tide keeping too close to the Gunfleet in scant north-westerly winds; and, lastly, from their standing in too close to the sand when working, and grounding when in stays.

**TIDES.**—At the north-east end of the Gunfleet, it is high-water, full and change, at 11h. 40m. ; springs rise 12 feet, neaps 8 feet, and neaps range 4 feet, and the rates of their streams are  $2\frac{3}{4}$  knots and one knot per hour, respectively.

Between the Shipwash and West rocks the stream at half-flood sets S.W. by W.  $\frac{1}{2}$  W., and at half-ebb N.E.  $\frac{1}{2}$  E.

Between the Shipwash and Long sand, the first-quarter ebb sets N.E.  $\frac{1}{2}$  E. ; and from 2 to  $4\frac{1}{2}$  hours' ebb, the set is E. by N.

About one mile to the eastward of Gunfleet N.E. buoy, the first of the flood sets South ; from one to  $4\frac{1}{2}$  hours' flood the set is W.S.W., and last-quarter flood N.W. The first of the ebb is North, one hour to  $4\frac{1}{2}$  hours' ebb, N.E.  $\frac{1}{2}$  E., and last-quarter ebb, E.S.E. Over all the lower portion of the Swin, the last of the flood-stream has a general tendency to the north-west ; in point of fact the stream still retains its rotatory motion revolving with the hands of a clock, as noticed in the case of the stream at other places between Cromer and the Thames.

During springs, the stream between the north-east end of the Gunfleet and the Sunk turns at 12 o'clock ; between the north-east end of the Gunfleet and the Naze at 0h. 10m., and at the upper end of East Swin at 0h. 20m.

The flood sets strongly across Long sand head into Black deep and East Swin, and also in like manner across the north-east end of the Gunfleet into the Wallet, the last of the flood in both cases veering north-westward right across them. There is a strong indraught during the flood into Whitaker swatchway, and both flood and ebb set obliquely across all the shoals.

**RIVER CROUCH**, from its source in the south part of Essex to its outlet at Foulness, is 26 miles long, its course for the last 5 miles being between low embanked lands. Below Foulness island the channel is uneven and encumbered with a Middle ground, but for some miles within Foulness the bed is uniform from side to side. A shoal called the Bar, situated nearly in the middle of the river, with 2 feet over it, and midway between Pagglesham creek and Burnham, is the greatest obstruction. The northern passage, which is the widest and deepest, has 3 fathoms in it at low-water.

**BURNHAM**, known for its important oyster fishery, is upon the left bank of the Crouch, 5 miles above its outlet ; it has also a small coal and corn trade.



The general shipping-place, however, is at Hull bridge, a sort of causeway, dry at low-water, 12 miles above Burnham, where is also a quay. Colliers lie in the stream and deliver their coals into lighters for Battle bridge (the first fixed one), 3 miles higher up. During springs, vessels drawing 10 and 11 feet reach Hull bridge, and those of 8 feet draught get up to Battie bridge. Corn is exported, and corn and oilcake are received.

Population, 2,032 in 1871.

**BUXEY SAND**, in the middle of the approach to the Crouch, being only separated by the shallow swatchway, the Spitway, from the Gunfleet, may be considered as a continuation of that sand; it is bounded to the southward and north-westward by Whitaker and Raysand channels, the two entrances to the Crouch river. Six feet upon its east end is one third of a mile to the northward of Swin spitway buoy, its south side (which is irregular) then holds W.  $\frac{1}{2}$  S. for 6 miles to the entrance of the Crouch; its north side is convexed, and the sand at its widest part is  $1\frac{1}{2}$  mile across; the greater portion of it dries from 4 to 5 feet at low-water.

**BEACONS and BUOYS**.—The Buxey sand is marked by a beacon and a *can* buoy on its north-west side, and by two *red conical* buoys on its south-east side.\*

**Buxey Beacon** is upon the north-west dry part of the sand, S.W. by W.  $\frac{1}{3}$  W.,  $1\frac{1}{3}$  mile from Buxey North buoy; it is an iron cylinder, 36 feet high, surmounted by a ribbed horizontal cross. From it Great Holland windmill appears in line with Eastness point N.E.  $\frac{3}{4}$  E.

**DIRECTIONS for Entrance to the Crouch**.—**Whitaker Channel**, the southern entrance into the river Crouch, having the Buxey sand to the northward, and Whitaker spit and Foulness sand to the southward, is marked by Whitaker spit *spherical* buoy; the Ridge, a *chequered red* and *white can* buoy, lying in 12 feet on the Foulness side opposite to the inner end of the Buxey, and by South and West Buxey *red conical* buoys to the northward.\*

The course through Whitaker channel is at first West, with South Buxey buoy on the starboard hand, and the Ridge buoy to port, and having passed the latter, keep more southerly and close to Foulness sand to avoid the Sunken Buxey with 6 feet upon it, which narrows the channel to a cable across, and when clear of the latter shoal, the Crouch has been entered.

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\* For positions of buoys, see page 317.

**Raysand Channel**, which connects the head of the Wallet and Swire Hole with the Crouch, is formed by the Buxey to the south-eastward, and Dengie flat and Raysand to the westward; it is very narrow, with 12 to 15 feet in it at low-water, and is steep-to on the Buxey side.

**Swire Hole**, the head of the deep water in the Wallet, is between Bachelor spit and the shoals about the entrance of the Colne to the northward, and the Buxey to the southward. Many vessels anchor in it in the winter season during southerly and south-westerly gales, in preference to riding in the Swin. The best berth is one mile to the eastward of Buxey North buoy, where the holding ground is good, and the depths 6 and 7 fathoms.

From abreast the Spitway, Bridgewick barn, just clear of the north-east end of the coast-guard houses, bearing W.  $\frac{3}{4}$  S., will lead through Swire Hole and clear the Buxey to the northward, until St. Osyth priory is brought in line with the white house, N.E.  $\frac{3}{4}$  N.; this latter mark leads through Raysand channel to abreast Buxey West buoy; then a conspicuous tree on Foulness island, in line with East Newlands farmhouse, bearing S.W. by W.  $\frac{3}{4}$  W., will lead into the entrance of the Crouch to within one mile of Foulness, when a pilot should be obtained.

**TIDES**.—It is high-water, full and change, at Foulness, at 0h. 5m., and at Hull bridge, at 0h. 25m. Springs rise  $14\frac{1}{2}$  feet at Foulness, and 16 feet at Hull bridge. Neaps rise  $10\frac{1}{2}$  feet and 11 feet.

## WEST SWIN.

The West Swin extends from the upper part of the East Swin to the Nore, and is bounded by Foulness and Maplin sands to the north-westward, and Barrow, Mouse, and Oaze sands to the south-eastward. Like the East Swin it is at such a distance from the low Essex coast line that its navigation is entirely dependent on artificial marks, but the admirable system by which it is buoyed and lighted renders its navigation by no means difficult. It is a channel 16 miles long, with an average width of one mile.

**SOUTH-WEST REACH**.—That part of the West Swin extending from Swin Middle light-vessel to Maplin lighthouse is named the South-west reach, and is much used as an anchorage on account of the excellent shelter it affords. In westerly winds, vessels waiting the turning of the tide usually anchor in it under the Maplin, but in

easterly winds the best berth is with Swin Middle light-vessel bearing North, one mile distant, in 6 to 7 fathoms ; higher up the water is deeper. In the South-west reach is the shallowest water in the Northern channel through the Estuary of the Thames, for here a narrow ridge of less than 24 feet stretches from the Middle to the Foulness sand, making a bar to vessels of heavy draught.

**FOULNESS and MAPLIN SANDS** are different portions of an extensive flat projecting from the Essex shore for the whole distance from Foulness to Shoeburyness ; it is from one to 5 miles in breadth, dries in patches throughout, shelves regularly from the main, and is broken and rendered irregular in several places by swatchways, or fleets. From Whitaker spit, already mentioned as the north-east extremity of the flat, its outer margin extends generally S.W.  $\frac{1}{4}$  S., for  $6\frac{1}{2}$  miles ; W. by S.  $\frac{1}{2}$  S., 7 miles ; and W.  $\frac{3}{4}$  N., 5 miles, to abreast Shoeburyness. The south-east point is marked by a pile lighthouse, on the southern side are beacons for running the measured mile, and along the south-eastern and southern sides it is marked by eleven *black conical* buoys one of which is illuminated by gas.\*

**MAPLIN LIGHTHOUSE**, S.W. by S., 5 miles from Whitaker beacon, and S.W.  $\frac{1}{2}$  S., 4 miles from Swin Middle light-vessel, was erected in 1841 in lieu of the Sheers beacon. This lighthouse, supported on screwed piles, is painted red, and shows an *occulting red* light disappearing for *three seconds* every *half minute*, 36 feet above high-water, visible at the distance of 11 miles in clear weather, from the bearing E. by N.  $\frac{3}{4}$  N. (one cable southward of Blacktail spit buoy) through north and west to South, thus masking Blacktail spit, S.E. Maplin, and Maplin buoys ; while between the bearings N.  $\frac{1}{3}$  E. and N. by E. the light is *white* to indicate the channel between the Girdler light and Shivering sand buoy. A strip of *white* light is also exhibited from a window 13 feet below the lantern, on a W. by N. bearing, marking Maplin spit buoy.

**Fog Signal.**—A bell is sounded *once every ten seconds* during thick or foggy weather.

From the lighthouse Mouse light-vessel bears S.W. by W., distant 4 miles ; and Blacktail spit buoy, W. by S.  $\frac{3}{4}$  S.,  $5\frac{1}{4}$  miles.

**CAUTION.**—In passing the lighthouse vessels should give it a wide berth, as the sand has extended in a southerly direction.

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\* For position of buoys see the end of this chapter, page 318.



**MEASURED MILE.**—Four beacons have been erected within the southern margin of the Maplin sand between the East and South Shoebury buoys, to mark a distance of 6,080 feet, or one geographical mile, on the bearings E.  $\frac{1}{2}$  N. and W.  $\frac{1}{2}$  S., for the use of Her Majesty's steam-vessels testing their speed. The beacons at the eastern end are, respectively, W.  $\frac{1}{2}$  N. and W. by N., about  $3\frac{1}{2}$  miles from Mouse light-vessel; and those at the western end are N.E. by E.  $\frac{1}{2}$  E. and E.N.E., about  $3\frac{1}{3}$  miles from the Nore light-vessel.

**Buoys.**—Also, in connection with the above beacons, two conical buoys, painted *red*, with the word Admiralty in white letters, and each surmounted by a staff and triangle, have been placed near the sand, one mile apart, and parallel to the direction of the beacons, or E.  $\frac{1}{2}$  N. and W.  $\frac{1}{2}$  S. from each other. The western buoy is in 40 feet at low water with the two western beacons in line, and the eastern buoy in 36 feet with the eastern beacons in line about 3 cables off the outer beacons and the edge of the Maplin sand. They are intended to mark out and to determine the track of vessels while testing their speed.

**BARROW SAND.**—Barrow sand (alluded to on pages 306 and 310) beginning between Middle and Sunk sands, is divided into several portions, termed East Barrow, Barrow, and West Barrow; the latter two, abreast Maplin lighthouse, reduce the width of the West Swin to three-quarters of a mile. The Barrow, collectively, is  $15\frac{1}{2}$  miles long, and 2 miles to one mile wide, and extensive portions of it dry from  $3\frac{1}{2}$  to  $6\frac{1}{2}$  feet at low-water.\*

**MOUSE SAND,** originally detached, is now joined to, and forms the western extremity of, West Barrow; a great part of the sand dries, and it is very steep on the northern or Swin side. The Barrow and Mouse sands are marked by a light-vessel named the Mouse on their western extremity, and by four *can* buoys *painted black and white* on the north-western side.\*

**MOUSE LIGHT-VESSEL** is moored in 4 fathoms, at the distance of one-quarter mile from the depth of 12 feet upon the western end of the Mouse, and exhibits a *green* light, which *revolves every twenty seconds*, at 39 feet above the water, and visible at the distance of 11 miles in clear weather.

**Fog Signal.**—A gong is sounded during thick or foggy weather.

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\* For positions of buoys, see the end of this chapter, p. 319.

The vessel lies with Burnham mill, open to the westward of Foulness mill, bearing N.N.W.  $\frac{1}{2}$  W. ; and Shoebury ness just open north of the north-eastern mile-beacon, W. by N. ; Maplin lighthouse, N.E. by E., distant 4 miles ; Blacktail spit buoy, W.  $\frac{1}{2}$  N., 2 miles ; Nore light-vessel, W.  $\frac{2}{3}$  S.,  $7\frac{1}{2}$  miles ; and East Oaze buoy, S.E.  $\frac{1}{2}$  S.,  $1\frac{8}{10}$  mile.

Above the Mouse light-vessel, the West Swin increases considerably in width, extending from the Maplin over to the Oaze, (which will be found described on page 341,) and southern flat. The following buoys mark the southern boundary of the remaining portion of West Swin :—The North Oaze a *can* buoy painted in *black and white* vertical stripes ; the West Oaze a *spherical* buoy with *staff and triangle* painted in *black and white* horizontal stripes, and the Cant a *can* buoy painted in *black and white* chequers.\*

**NORE LIGHT-VESSEL**, the divisional mark between West Swin and Sea reach, the first reach in the river Thames proper, is moored in 23 feet at the east end of the Nore sand, and shows a *white* light, which *revolves every half-minute*, at 35 feet above the water, and may be seen in clear weather at the distance of 10 miles.

**Fog Signal.**—A gong is sounded during thick or foggy weather.

From the light-vessel, the two easternmost mills at Miletown are in line, bearing S.W.  $\frac{3}{4}$  W. ; and Minster church is in a line with the east end of a triangular hedge-row, named Mizen hedge, S. by W.  $\frac{2}{3}$  W. ; Southend pier lighthouse is N.W.  $\frac{1}{2}$  N., distant  $4\frac{1}{10}$  miles ; River Middle East buoy, N.W.  $\frac{1}{4}$  W.,  $3\frac{3}{10}$  miles ; Blacktail spit buoy, E. by N.  $\frac{1}{8}$  N.,  $5\frac{1}{2}$  miles ; and Mouse light-vessel, E.  $\frac{2}{3}$  N.,  $7\frac{1}{2}$  miles.

The first light-vessel established was the one placed at the Nore in 1732, at 41 miles below London bridge. She is a common point of arrival and departure for vessels proceeding into, or out of, the Thames.

**DIRECTIONS for West Swin.**—As previously remarked the navigation of the West Swin depends almost entirely on artificial marks, for the shore abreast is too low and distant to be often distinguished ; Churchend church spire, and a white windmill near it, are the most conspicuous objects on Foulness island ; whilst farther west, Wakering church, and Shoebury ness may be made out ;

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\*. For positions of buoys, *see* pages 319 and 320.



the channel is however well buoyed with *conical black* buoys on the starboard side in entering, and *black and white can* buoys on the port side.

From Swin Middle light-vessel a S.S.W.  $\frac{3}{4}$  W., course for 4 miles, leads about half a mile to the eastward of Maplin lighthouse, then W. by S.  $\frac{3}{4}$  S.,  $4\frac{3}{4}$  miles, leads three-quarters of a mile to the westward of Mouse light-vessel, and then W. by S., 7 miles, carries up to the Nore.

In working, when within one mile of Maplin lighthouse do not bring it to the southward of S.W. by W.  $\frac{1}{2}$  W., to avoid the flat which has extended out from the Maplin. Stand towards that sand into 6 fathoms, and towards the Barrow into 7 fathoms.

Abreast Maplin lighthouse, or in Shoe Hole, as it is termed, tack on the first shoal cast, as the sands on both sides fall suddenly into deep water. Above Maplin lighthouse, stand towards the Mouse and Oaze into 7 fathoms, and towards the Maplin into 8 and 7 fathoms. When above the Cant, Nore light-vessel must not be brought to the northward of W.N.W., as the sand is very steep.

**CAUTION.**—In the lower portion of West Swin, the flood stream sets strongly upon the Maplin, and the ebb stream sets across Barrow sand. It is also necessary to remember in ships of any draught that the tides in the Thames are greatly influenced by the wind. In south-west gales the tide has been known to fall 3 or even 4 feet below the low water of ordinary springs, and in north-west gales to rise a corresponding height above high water. Heavy draught vessels should remember this when passing the 24 feet Bar in south-west Reach.

**TIDES.**—It is high-water, full and change, at the Nore, at 0h. 30m.; springs rise  $15\frac{1}{2}$  feet, neaps 13 feet, and neaps range  $10\frac{1}{2}$  feet.

## BUOYS IN ESTUARY OF THAMES.

### BUOYS IN THE WALLET.

**Priory Spit** is a *red conical* buoy, in 12 feet, at the spit end, with the tower of St. Osyth priory in line with Martello tower No. 3, bearing N.  $\frac{1}{2}$  W.; East Mersea church just open of Colne point, N.W.  $\frac{1}{4}$  W.

**Wallet Spitway** is a *spherical* buoy, *striped red and white horizontally*, with *staff and St. Andrew's cross*, in 24 feet; with Brightlingsea church tower in line with a dark-coloured house on

the beach, bearing N. by W.  $\frac{1}{2}$  W.; Clacton pier-head in line with a gable of a red-brick house, N.N.E.  $\frac{1}{2}$  E.

**Swin Spitway** is a *black conical* bell buoy, in 18 feet, with the body of St. Osyth church in line with a small white house, bearing N.  $\frac{3}{4}$  W.; and Great Clacton church in line with the middle of Clacton pier, N. by E.  $\frac{1}{2}$  E.

**Knoll**.—The south-east end is marked by a *can* buoy, *striped vertically red and white*, with *staff and cage*, in 13 feet,  $2\frac{1}{2}$  miles from Colne point; with Great Clacton church on with the black gable-end of a farm-house, bearing N.E.  $\frac{1}{2}$  E.; and Brightlingsea church, in line with a white house (called My Lady's), N.  $\frac{1}{4}$  W.

**N.W. Knoll**.—At the north-west spit is a *can* buoy, *striped red and white vertically*, in 24 feet, with Brightlingsea church, well open west of High clump, bearing N.  $\frac{3}{4}$  E.; Clacton water works tower, E. by N.  $\frac{3}{4}$  N.

**North Eagle** is a *can* buoy, *chequered red and white*, in 5 fathoms, near the northern elbow of the Eagle, with Brightlingsea church tower its width open west of a long red-tiled barn, bearing N.  $\frac{1}{2}$  W.; north side of No. 6 Martello tower touching south side of No. 5 tower, E.N.E.

**Eagle**, a *red conical* buoy, lies on the south-west side of the Eagle shoal in 12 feet, opposite to, and bearing N. by W., nearly half a mile from, the Knoll buoy; from it, the black coastguard house, to the westward of Clacton cliff, is in line with No. 6 Martello tower, bearing N.E. by E.  $\frac{1}{2}$  E.; and Brightlingsea church is just open to the westward of Martello tower No. 2, N.  $\frac{1}{4}$  W.

**Bar Buoy**.—Colne bar is marked near its outer end by a *red conical* buoy, with *staff and globe*, in 30 feet, bearing N.W.  $\frac{1}{3}$  N., three-quarters of a mile from the Eagle buoy, with Martello tower No. 5, just to the eastward of Martello tower No. 4, bearing E. by N.  $\frac{1}{2}$  N.; and Brightlingsea church in line with the west end of Brightlingsea wood, N.  $\frac{1}{4}$  E.

**Bench head Buoys**.—A *spherical* buoy, *striped red and white horizontally*, lies on the south-east tail of the flat in 24 feet.

A *white* buoy, marking one of the limits of the oyster fishery, lies just to the eastward of the inner end of Bench head.

#### EAST SWIN BUOYS.

**N.E. Gunfleet**, a *spherical* buoy, *striped horizontally black and white*, with *staff and diamond*, near the north-east end of the Gunfleet,

in 28 feet, also marks the south side of Goldmer gat (described on page 288); from it, Walton hall appears open half its breadth to the northward of the Naze tower, bearing N.W.  $\frac{1}{4}$  W.; and Gunfleet lighthouse, S.W. by W.  $\frac{1}{2}$  W.,  $4\frac{6}{10}$  miles.

**Middle Gunfleet** is a *black conical* buoy, in 5 fathoms, with the north end of Walton barn touching the Naze tower, bearing N.N.W. westerly; Gunfleet lighthouse, W. by S.  $\frac{3}{4}$  S.,  $2\frac{1}{3}$  miles.

**Gunfleet spit** is a *black conical* buoy, in 5 fathoms, with the eastern trees at Felixstowe open to the eastward of Gunfleet lighthouse, bearing N.N.E.  $\frac{1}{2}$  E.; and Great Clacton windmill opening to the westward of a compact clump of trees, N.W.  $\frac{3}{4}$  W.

**S.W. Gunfleet** is a *black conical* buoy, in 4 fathoms, with Great Holland church in line with the southernmost of two wrecks on the sand, bearing N.  $\frac{3}{4}$  W.; and the tower of St. Osyth priory open a little to the westward of the coastguard houses between Nos. 5 and 6 Martello towers, N.W.  $\frac{1}{2}$  W.

**West Gunfleet** is a *black conical* buoy, in 4 fathoms, with the tower of Great Holland church half its breadth open to the northward of three trees in the foreground, bearing N. by E.  $\frac{1}{3}$  E.; and a black building eastward of a high house, in line with the north side of No. 2 Martello tower, N.W.  $\frac{1}{8}$  N.

**Swin Spitway**, a *black conical* buoy, is noticed on page 315.

**Whitaker Spit** is a *spherical* buoy, *striped black and white horizontally*, and surmounted by a *staff and diamond*, in 21 feet, bearing S.W.  $\frac{3}{4}$  S.,  $1\frac{4}{10}$  mile from Swin spitway buoy, and N.E.  $\frac{1}{2}$  E.,  $2\frac{6}{10}$  miles, from Swin Middle light-vessel; with the Naze tower N.E.  $\frac{1}{4}$  N.; and Southminster east windmill open to the northward of Tillingham coastguard house, W. by N.  $\frac{1}{4}$  N.

**Sunk Head** is a *chequered black and white can* buoy, in  $5\frac{1}{2}$  fathoms, 2 miles below the dry part of the Great Sunk; with the Naze tower in line with the middle of a long barn, bearing N.N.W.  $\frac{3}{4}$  W.; and Long-sand-head buoy, E.  $\frac{1}{2}$  S.,  $5\frac{2}{10}$  miles.

**West Sunk** is a *can* buoy *striped vertically black and white*, in 10 fathoms, about 6 cables from the western part of the Great Sunk sand; with Gunfleet lighthouse in line with the inner end of Walton pier, bearing N. by W.; Gunfleet lighthouse distant  $3\frac{1}{2}$  miles; and Sunk-head buoy, E.N.E.,  $4\frac{1}{2}$  miles.

**Heaps**, is a *can* buoy, *striped vertically black and white*, with *staff and cage*, in 6 fathoms, one mile from a depth of 18 feet at the eastern



end of the Middle sand ; with Brightlingsea church in line with a high clump of trees next east of a white house on the hill westward of St. Osyth, N.N.W.  $\frac{3}{4}$  W. ; and Gunfleet lighthouse, N.E.  $\frac{1}{2}$  E., distant  $5\frac{1}{2}$  miles.

**N.E. Middle**, is a *can* buoy, *striped vertically black and white*, in  $4\frac{1}{2}$  fathoms, with the cupola of St. Osyth priory open to the westward of St. Osyth church tower, N. by W.  $\frac{1}{4}$  W. ; Heaps buoy East,  $2\frac{4}{10}$  miles.

**North Hook Middle** is a *can* buoy, *chequered black and white*, in 27 feet, with a clump of trees to the northward of Great Clacton church in line with No. 5 Martello tower, bearing N.  $\frac{3}{4}$  E. ; and Swin Middle light-vessel, W. by S.  $\frac{1}{2}$  S.,  $2\frac{9}{10}$  miles.

**West Hook Middle** is a *can* buoy, *striped vertically black and white*, in 7 fathoms, about midway between S.W. Middle and North Hook Middle buoys ; with Whitaker and Buxey beacons in line, bearing N.W.  $\frac{1}{4}$  W. ; and Swin Middle light-vessel, W. by S.  $\frac{1}{4}$  S.,  $1\frac{3}{10}$  miles.

**S.W. Middle** is a *can* buoy, *striped vertically black and white*, with *staff and cage*, in 21 feet ; with Swin Middle light-vessel bearing N. by E.  $\frac{1}{4}$  E., distant 5 cables ; Maplin lighthouse S.W.  $\frac{1}{4}$  S.,  $3\frac{1}{2}$  miles. At low water springs not more than 20 feet can be reckoned on between S.W. Middle and N.E. Maplin buoys, gradually shoaling to 18 feet abreast N.E. Maplin buoy.

#### CROUCH RIVER BUOYS.

**South Buxey** is a *red conical* buoy, in 15 feet, near the outer end of a projection of the sand, named Swallow tail, W. by S.  $\frac{1}{2}$  S., 3 miles from Swin spitway buoy, and W.  $\frac{2}{3}$  N. 2 miles from Whitaker spit buoy. From it Ridge buoy bears W. by S.  $1\frac{9}{10}$  miles ; and West Buxey buoy, W.  $\frac{1}{4}$  S.,  $3\frac{2}{10}$  miles ; Whitaker beacon, S.S.E., 1 mile.

**West Buxey** is a *red conical* buoy in 7 feet, upon the west end of the sand, and W.  $\frac{1}{4}$  S.,  $3\frac{2}{10}$  miles from Buxey south buoy ; with West Mersea church open to the northward of St. Peter's chapel, bearing N.  $\frac{3}{4}$  W. ; and a conspicuous tree on Foulness island in line with East Newlands farmhouse, S.W. by W.  $\frac{2}{4}$  W.

**North Buxey** is a *chequered red and white can* buoy in 24 feet, near the north rounded portion of the sand, W.  $\frac{1}{3}$  N.  $3\frac{1}{2}$  miles from Wallet spitway buoy ; with Brightlingsea church, appearing midway between the end of the wood and No. 1 Martello tower, N.  $\frac{3}{4}$  E. ; and Buxey beacon, S.W. by W.  $\frac{1}{3}$  W., distant  $1\frac{1}{3}$  mile.

**Ridge** is a *can* buoy, *chequered red* and *white*, in 12 feet, on the North side of the Foulness sand, and south side of the Whitaker channel, 4 miles within the Whitaker spit buoy; from it Buxey beacon bears N.  $\frac{1}{2}$  W., distant  $1\frac{8}{10}$  miles, and Whitaker beacon E. by S.,  $2\frac{3}{10}$  miles.

### WEST SWIN BUOYS.

**N.E. Maplin** is a *black conical* buoy, in  $3\frac{1}{4}$  fathoms, at the north-east part of the sand; with Canewdon church, in line with the east end of the easternmost trees in Foulness island, bearing W. by N.  $\frac{3}{4}$  N.; and Clacton church, just open to the westward of Whitaker beacon, N.N.E.  $\frac{3}{4}$  E.; Whitaker beacon, distant  $3\frac{1}{10}$  miles.

**East Maplin** is a *black conical* buoy in  $5\frac{1}{2}$  fathoms, with Mouse light-vessel just open to the southward of Maplin lighthouse, bearing S.W. by W.; and Maplin lighthouse distant 7 cables.

**Maplin spit** is a *black conical occulting gas* buoy, with *staff* and *globe*, in  $5\frac{1}{2}$  fathoms. From it St. Nicholas church appears its length to the westward of Pan sand beacon, S.  $\frac{3}{4}$  E.; and Maplin lighthouse bears W. by N., distant 3 cables.

**West Maplin spit** is a *black conical* buoy, in 9 fathoms, on the western projection of the spit which extends in a southerly direction from Maplin lighthouse; with Maplin lighthouse bearing N.E. by N., distant 4 cables; Maplin spit buoy, N.E. by E.  $\frac{1}{2}$  E., 6 cables.

**Maplin** is a *black conical* buoy, in  $3\frac{1}{4}$  fathoms; with the tower of Canewdon church open to the northward of a house with three low chimneys, bearing N.W.  $\frac{3}{4}$  W.; Mouse light-vessel, S.W.  $\frac{2}{3}$  S., 2 miles.

**S.E. Maplin** is a *black conical* buoy, in 4 fathoms; with Canewdon church in line with the middle of a long barn on Foulness island, bearing N.W.; Maplin buoy, E.N.E., distant 2 miles.

**Blacktail spit** is a *black conical* buoy, with *staff* and *globe*, in 7 fathoms; with the west end of a remarkable clump of trees, in line with the coast-guard vessel in Havengore creek, bearing N.W.  $\frac{1}{4}$  N.; and Shoeburyness water tower in line with the N.E. measured mile beacon W.N.W.

**East Shoebury** is a *black conical* buoy, in 5 fathoms; with Berling church in line with N.E. measured mile beacon N.W.  $\frac{1}{4}$  N., and the crane at Shoeburyness just open north of N.W. measured mile beacon, W. by N.  $\frac{3}{4}$  N.



Between East and South Shoebury buoys are the measured mile beacons and buoys described on page 312.

**South Shoebury** is a *black conical* buoy in  $5\frac{1}{4}$  fathoms ; with Southchurch in line with the west end of a large house next west of Shoebury coast-guard station, N.W., and a white beacon on Grain island, open north of the Martello tower, W. by S.  $\frac{3}{4}$  S.

**Middle Shoebury** is a *black conical* buoy, in  $4\frac{1}{2}$  fathoms ; with Prittlewell church in line with the west end of a large red-tiled building at Southchurch, bearing N.W. by N. ; and Queenborough church, just open to the southward of a chapel at the west end of Mile-town, S.W.  $\frac{1}{2}$  S.

**Shoeburness, or West Shoebury**, is a *black conical* buoy, in 4 fathoms ; with Hadleigh castle, twice its breadth to the westward of Southend pier-head, bearing N.W.  $\frac{1}{2}$  W., Shoebury coast guard N.N.E.  $\frac{1}{4}$  E.

**N.E. Barrow** is a *can* buoy, *chequered black and white*, in 4 fathoms ; with Canewdon church, open to the northward of the trees on Foulness island, bearing W. by N.  $\frac{3}{4}$  N. ; Maplin lighthouse, S.W. by W.  $\frac{3}{4}$  W.,  $2\frac{7}{10}$  miles.

**East Barrow** is a *can* buoy, *striped vertically black and white* in 6 fathoms, E. by S.  $1\frac{1}{10}$  mile from Maplin lighthouse ; with Canewdon church in line with a small dark-coloured building next north of Foulness church, bearing N.W. by W.  $\frac{3}{4}$  W. ; and Barling church and Maplin lighthouse in line, W. by N.

**Middle Barrow** is a *can* buoy, *chequered black and white*, in 7 fathoms, with West Barrow buoy bearing W.S.W. distant  $1\frac{6}{10}$  mile ; and Maplin lighthouse, N. N. E., 8 cables.

**West Barrow** is a *can* buoy, *striped vertically black and white*, in  $7\frac{1}{4}$  fathoms, near the West Barrow ; and S.W.  $\frac{3}{4}$  W.,  $2\frac{3}{10}$  miles from Maplin lighthouse ; with Foulness church N.W.  $\frac{1}{4}$  N. ; and Mouse light-vessel, S.W. by W.  $\frac{3}{4}$  W.,  $1\frac{7}{10}$  mile.

**North Oaze**, is a *can* buoy, *striped vertically black and white*, in  $5\frac{1}{2}$  fathoms, on the north side of Oaze sand ; with Great Wakering church, bearing N.W.  $\frac{3}{4}$  W. ; and Mouse light-vessel, N.  $\frac{1}{4}$  E.,  $1\frac{1}{4}$  miles.

**West Oaze** is a *black and white horizontally striped spherical* buoy, with *staff and triangle*, in  $4\frac{1}{2}$  fathoms, off the western extremity of Oaze sand, S.W.  $\frac{3}{4}$  W.,  $3\frac{1}{2}$  miles from Mouse light-vessel, and half a mile from 18 feet depth upon the sand ; with the two Mussel-houses near Shellness, at the south-east point of Sheppy, bearing S.S.W. ;



and Prittlewell church, its length on the west end of a terrace at Shoebury, N.W.  $\frac{1}{2}$  W.

**Cant**, a *chequered black* and *white can* buoy, in 4 fathoms, on the north edge of the southern flat, one cable from the depth of 5 feet on East Cant, or Cant edge, shoal, lies W.  $\frac{1}{2}$  S.,  $1\frac{6}{10}$  mile from West Oaze buoy ; with Warden point in Sheppy, bearing S. by W.  $\frac{1}{4}$  W. ; and the eastern coke chimney at Whitstable, appearing midway between the western coke chimney and Whitstable church, S. by E.  $\frac{3}{4}$  E.

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## CHAPTER IX.

## ESTUARY OF THE THAMES. PART III.

## NORTH FORELAND TO THE NORE.

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VARIATION,  $16^{\circ} 50'$  to  $16^{\circ} 40'$  West in 1889.

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The third part of the Estuary of the Thames is devoted to a description of the channels into the river proper, on the south side of the Estuary.

The sand-banks extend in broken patches even to a greater distance off the coast of Kent, than off the Essex shores, and through these banks are various channels known as the South channel, the Queen's channel, the Prince's channel, the Alexandra channel, and the Duke of Edinburgh channel, all leading into the main channel of the Estuary known as the Black and Oaze deeps. Only one of these channels is available at night, viz., the Prince's, in which there are patches of 17 to 18 feet at low water ; the deeper channels and the only ones available to large vessels are the Duke of Edinburgh and Alexandra. All are buoyed on the uniform system, viz., with *conical* buoys of one colour on the starboard side in entering, and with *can* buoys of two colours on the port side. In the Alexandra and Queen's channels, the buoys are coloured *red* and *red and white*; in the other channels, *black* and *black and white*.

The navigation of these various channels on the southern side of the Thames Estuary depends in a great measure on artificial marks ; for although the land on the Kentish side is higher, and has more conspicuous objects on it, than that on the Essex side, yet the weather is so frequently misty, and the channels are so far off shore, that they can seldom be distinguished with certainty ; but there are several beacons erected on the sands to aid navigation, and these, combined with the excellent buoyage, render it comparatively easy.

Following the course of previous chapters, the coast will be first described, and then the off-lying banks and channels.



**NORTH FORELAND**,\* the outer boundary on the south side of the Thames Estuary, is a promontory of nearly perpendicular chalk cliffs which, varying in height from 60 to 120 feet, form the sea front of the south-eastern and north-eastern sides of the isle of Thanet from Pegwell bay to Cliff-end. It is rendered more conspicuous by a light-tower of octagonal form and coloured white, which stands at about 300 yards within the brink of the cliff. At half a mile to the northward of the lighthouse is Moro or Kingsgate castle, a castellated building of flint, close to the cliff on the south point of Kingsgate bay, and at one-quarter of a mile farther to the northward upon Whiteness, the north point of the bay, is Neptune tower, white, with a wide basement.

**LIGHT**.—North Foreland has long been an important light station. A wooden structure used as a lighthouse was burnt down in 1683, when the present tower was erected, which exhibited a coal fire from its summit; in 1790 oil lamps were substituted, the tower having been heightened and improved, and in 1834, a further improvement was made in the light by the introduction of parabolic reflectors. It is now a dioptric light of the first order, which *occults every half minute*, that is, it suddenly disappears every *half minute for 5 seconds*; it is *white* except between the bearings S. by E.  $\frac{3}{4}$  E. and S. by W., where it shows *red* to clear the east end of Margate sand, the eastern limit of the red light passing two cables eastward of East Margate buoy. It is 188 feet above high-water, and visible in clear weather from the distance of 20 miles.

A Life-Boat is stationed at Kingsgate bay.

**FORENESS**, N.W.  $\frac{1}{2}$  N., two-thirds of a mile from Whiteness, is the north-east point of the isle of Thanet, and the turning point to Margate road and South channel; its height is about 50 feet.

**LONGNOSE LEDGE**, a dangerous reef of chalk rocks, projects north-east 4 cables from Foreness, the outer end is marked by a *can* buoy in four fathoms, painted in *black* and *white vertical stripes*.†

By day, North Foreland lighthouse kept open to the eastward of Neptune tower, bearing S. by W., and Birchington north, or seed

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\* See Admiralty chart of river Thames, sheet 2, North Foreland to the Nore, No. 1,607; scale, mile = 1·4 inch: Also, England, East Coast, North Foreland to Orfordness, including the entrance to the Thames, No. 1610; scale, mile = 0·5 inch.

† For positions of buoys, see the end of this chapter, page 348.

mill, open of Margate pier-head, bearing West, clear the east and north sides of this ledge. At night, North Foreland light, bearing S. by W.  $\frac{1}{4}$  W., and Margate break-water *red* light open, W. by S., will clear them also. The *red* sector of North Foreland light must on no account be opened until the *red* light on Margate break-water is seen.

**MARGATE.**—From Foreness the line of cliff extends in a W. by N.  $\frac{1}{4}$  N. direction for  $1\frac{1}{2}$  miles to Fort point, immediately beyond which is the town of Margate, built chiefly on the declivities of two hills and in the valley between. Its handsome modern church, with a square tower 135 feet high, stands on the cliff at the north-east part of the town near Fort point, and may be seen at a considerable distance. The old church, built of flint, with a square tower surmounted by a small pointed turret, standing on an eminence at the south end of the town, and the pier lighthouse, are also conspicuous objects. Margate is chiefly noticed as a watering-place, but it has some little trade, and a considerable fishery for skate, soles, &c., is carried on. It is connected with London by the London, Chatham and Dover Railway, and also by a branch of the South-Eastern Railway, which have stations to the westward of the town. Vice-Consuls for most foreign nations are resident. Supplies of all kinds are abundant, and anchors of any size can be obtained. Population 15,889 in 1881. The number of vessels entering the port annually are nearly 500, of an aggregate tonnage of nearly 50,000 tons.

**The Harbour** of Margate consists of a small bay, defended by a substantial stone pier or break-water on its northern side, 300 yards in length, with an average breadth of 17 yards, and extending in a curved form to the westward. The harbour, which has an area of  $7\frac{1}{2}$  acres, is open to the north-west, the bottom is sand and mud; it dries at low-water, but there is a depth of 12 feet at the pier-head at high-water springs, and about 10 feet at neaps.

There is a patent slip capable of receiving a vessel of 300 tons.

From the foot of the harbour pier, an iron landing-pier, much used by steam-vessels, extends northward 1,433 feet to a depth of 9 feet at low-water.

**LIGHTS.**—A handsome stone tower of the Doric order, 70 feet high, stands at the outer end of the harbour break-water or pier; it exhibits all night a *fixed red* light, elevated 85 feet above high-water, and visible in clear weather at the distance of 10 miles.

There is also a small *green* gas-light on the head of the landing-pier.

**Pilots** for the river Thames and over sea can be obtained here.

**Two Life-Boats** belong to the port, and there is also the usual life-saving apparatus.

**TIDES.**—It is high-water, full and change, at Margate, at 11h. 45m. ; springs rise  $15\frac{1}{2}$  feet, neaps 13 feet, and neaps range  $10\frac{1}{2}$  feet.

**MARGATE ROAD**, between the shores adjoining Margate and the south side of the eastern portion of Margate sand (*see* page 329), affords good shelter in southerly and south-west winds, and anchorage may be taken in 8 fathoms about one mile off-shore, between Foreness and Margate, with North Foreland lighthouse bearing S. by E.  $\frac{3}{4}$  E. ; or off the town in 7 fathoms, mud, outside the chalky ground.

**The COAST** from Margate takes a general W. by N. direction to Whitstable. At Westbrook, half a mile to the westward of Margate, is the sea-bathing infirmary, a large brick building with wings ; and a terrace of lofty houses. At 2 miles from Margate is Westgate bay, an open space between the cliffs, in which the coast-guard buildings are conspicuous objects. Another break occurs at Epple bay, half a mile farther west, and thence the cliff is unbroken for one mile to Cliff-end, where it terminates. The whole of this coast is subject to a continual waste, which has been estimated at the average rate of 2 feet annually.

**Birchington** village stands half a mile from the coast, on an eminence to the south-east of Cliff-end, and may be known by its large dark-looking church spire. Rather more than 2 miles to the southward, on the highest ground in Thanet, is Minster mill. Quex spire, three-quarters of a mile south of Birchington, is also conspicuous.

From Cliff-end to Reculver,  $3\frac{1}{4}$  miles, is the low flat shore of the valley of the river Stour, which, dividing in the lower part of its course, sends one branch to the sea at Sandwich haven, and the other to the estuary of the Thames at North Mouth sluice, one mile to the eastward of Reculver, and forms the western limit of the isle of Thanet.

St. Nicholas church, which has a conspicuous tower, stands upwards of one mile and a quarter inland, and when on a S.S.W. bearing from the sea, appears midway between Cliff-end and Reculver.

**Monkton Beacon** is a stone obelisk on the highest ground  $1\frac{1}{4}$  miles S.E. by E.  $\frac{1}{4}$  E. of St. Nicholas church.

**RECVLVER** is  $3\frac{1}{4}$  miles to the westward of Cliff-end. This is the site of an ancient Roman fortress, "Regullium," the sister fortress of Richborough (Rutupiæ), which protected the north mouth of the Wantsome, dividing Thanet from the main land. In 669 King Egbert gave Reculver to "Bassa" to build a Minster. The ancient church, which stood within the Castrum, was pulled down in 1809. Two towers (commonly called the Reculvers) are successors and substitutes for the old West towers named the Sisters. The coast is subject to much waste here, so that the Reculvers, which formerly stood some distance inshore, now stand on the brink of a low earth cliff. The towers being a conspicuous sea-mark, the coast is now protected from further encroachment of the sea by groynes, maintained by the Trinity Board. The town of Reculver is supposed to have been to the northward, on a site now overflowed by the sea.

To the westward of Reculver, the coast to Herne bay is composed of high earth cliffs; thence to Whitstable of low undulating cliff of similar character.

**HERNE BAY** is the name given to a modern watering-place,  $2\frac{3}{4}$  miles from Reculver. Whatever the coast may have been formerly, there is no longer any vestige of a bay, as it maintains a nearly straight direction. The town, consisting of fine buildings, greatly resorted to by summer visitors, extends along the shore nearly one mile east and west. Near the centre, and fronting the sea, is a lofty clock-tower, a short distance to the westward of which is a low white windmill, and at the western extremity of the town is a coast-guard station. A pier, constructed on iron piles, projects in a northerly direction from the shore. The village of Herne,  $1\frac{1}{2}$  mile south of the town of Herne bay, is surrounded by trees, and on the high land to the north-east of the village is Herne mill, black, with a white top, which is a conspicuous object from the sea and visible many miles.

**Stud Hill**, the second undulation of the cliff to the westward of Herne bay pier, has a few small houses upon it. Between Stud hill and Herne bay is an oyster fishery pier.

**WHITSTABLE**, at the south point of the entrance to the East Swale, which separates the isle of Sheppey from the mainland of Kent, described on page 330, is a town of some note, from the large oyster fishery with which it is connected; its church, white, with a short

square tower, stands on rising ground to the eastward. There are also above the town a conspicuous building, and two windmills useful as marks ; and to the eastward of the harbour are two tall chimneys. On the coast an ancient causeway called the Street, dries out from the shore at Whitstable for one mile at low water. This is popularly supposed to be part of a submerged town.

**Harbour.**—Whitstable has a small harbour capable of affording shelter to twenty vessels of 150 tons each ; it is principally used by colliers. About 580 vessels enter annually, of an aggregate tonnage of 46,000 tons.

**Light.**—A fixed *white* light is shown at the harbour. When the harbour is full of shipping a fixed *red* light is shown 15 feet under the white light.

**Supplies.**—Coal may be obtained in moderate quantities, and steamers of 13 feet draught coaled alongside the quay at high water. Small repairs can be readily executed. All other supplies can be obtained at short notice.

**Patent Slip.**—There are two patent slips at Whitstable capable of taking up vessels of 250 tons.

**Signals.**—The following signals are shown from a flagstaff at the entrance of the harbour :—

1. A *red* flag is hoisted half-mast when there is a depth of 10 feet of water in the harbour.
2. A *red* flag half-mast, with ball under, when there is a depth of 11 feet of water in the harbour.
3. A *red* flag half-mast, with ball over, when there is a depth of 12 feet of water in the harbour.
4. A *red* flag alone at mast-head, when the depth exceeds 12 feet.
5. When a *black* ball alone is hoisted, vessels are to anchor in the bay, and wait for instructions from harbour-master.

The oyster fisheries are the property of a company, and give employment to numerous dredgers. A considerable number of the inhabitants are also employed in the coasting and coal trade. The imports are chiefly coal for the supply of this part of Kent, conveyance of which to the interior is facilitated by the railway to Canterbury. Population, 5,481 in 1871.

The coast to the westward of Whitstable is low and marshy ; through it runs Faversham creek, having its outlet into the Swale at nearly 5 miles from Whitstable.

**SHEPPEY ISLAND**, separated from the coast of Kent by the Swale, a narrow channel which is in one part almost dry at low water, is  $8\frac{1}{2}$  miles long, in a N.W. by W. and S.E. by E. direction, and nearly 4 miles broad. The south-west part of the island is low and only protected from the sea by embankments; the ground rises towards the centre, and on the north-east side are cliffs of from 80 to 100 feet in height. The island is entirely composed of London clay, which here abounds with interesting fossils. The cliffs on the north-east coast are subject to much denudation, owing principally to land slips caused by percolating water. On Sheppey is the important little town of Sheerness, with its dockyard, and the municipal borough of Queenborough.

**Coast.**—Shellness, the south-east point of the isle, and north point of the entrance to the East Swale, is nearly 3 miles N.W. by W. of Whitstable, and may be recognized by its low yellow beach with a square beacon and coast-guard buildings upon it.

From Shellness the shore continues low for 3 miles to the northward, when it rises suddenly at Warden point, a steep clay cliff 80 feet high. Leysdown village and church are conspicuous on the rising land, rather more than one mile to the southward of Warden point, and half a mile within the low shore just noticed. Clay cliffs, from 20 to 80 feet in height, form the coast between Warden point and Minster, beyond which they decline, and at half a mile terminate in low land, protected by groyne and a sea-wall, extending for about  $2\frac{1}{4}$  miles to Garrison Point, Sheerness, the north-west extremity of the island.

**Minster** village,  $3\frac{1}{2}$  miles to the westward of Warden point, and nearly half a mile from the coast, stands upon the north-west end of the high part of Sheppey, and its church, with a short square tower surmounted by a white turret, is the most prominent object on the island, being visible from all directions seaward. This church is said to have been in the middle of the island in 1780, so rapid is the waste of the north land of Sheppey.

A coast-guard station is on the shore between Minster cliffs and Cheney rock house, adjoining Bankstown, a suburb of Sheerness: the house is a brick building and the residence of the foreman of the oyster grounds on this part of the coast.

**At Sheerness**, the dock-yard chapel with a square tower and flag-staff, Miletown church and mills, the Roman Catholic chapel, and the masting sheers rising above all, are the most conspicuous fixed objects.

### SOUTH CHANNEL, INCLUDING THE EAST SWALE, AND FOUR-FATHOMS CHANNEL.

The channel generally known as South channel, is the passage nearest the coast, and is formed between the coast of Kent to the southward ; and the Margate and Hook sands, the east Spaniard and Middle, to the northward ; it includes Margate road, and leads about one mile off-shore, through Gore and Horse channels, and thence by the Overland passage between the isle of Sheppey and Spaniard shoals. It is mostly frequented by the smaller class of shipping of not more than 12 feet draught of water. On the southern side of South, Gore, and Horse, channels, are the following dangers :—

**NAYLAND LEDGE** extends to the north-east nearly half a mile from the cliff near the infirmary on the west side of Margate. Chislet mill (in-shore of Reculver) open of Cliff-end, will clear it in 15 feet at low-water, but a good offing by the lead is the best guide.

Between Margate infirmary and Cliff-end are several projecting ledges of rock, which, from the difficulty in estimating distance from the cliffs, are very dangerous when covered. They should not be approached so near as to shut Foreness in with Fort point. In hazy weather the lead must be depended on to clear them.

**RECVLVER SAND** is a continuation of the flat adjoining the shore to the westward of Cliff-end. The sand extends north-east  $1\frac{1}{2}$  miles from Reculver towers, and nearly joins the Margate Hook sand, the channel between them being very narrow ; the water deepens gradually from the shore to the extremity of the sand where there is 9 feet. Its outer extremity is marked by a *black* and *white* vertically striped *can* buoy.\*

**Black Rock**, on Reculver flat, has Reculver towers and St. Nicholas church nearly in line, bearing S.E. by S., and is distant half a mile from Reculver ; it dries only at low-water springs, when it has 3 feet water surrounding it.

**HERNE BAY FLATS** lie to the north-eastward of Herne bay pier-head, at three-quarters of a mile from which there is a depth of only 3 feet ; their outer edge, in 6 feet, is over a mile to the northward of the cliff eastward of the town.

**HORSE** is a narrow ridge of sand, having 7 to 11 feet over it, extending from the Herne Bay flats to that part of Margate sand

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\* For positions of buoys, see the end of this chapter, page 348.

named Last. It is marked by a *black and white chequered can* buoy in 10 feet, on the south-west side of the channel over the ridge.\*

The following shoals bound the northern side of South, Gore, and Horse channels :—

**MARGATE SAND**, a very extensive bank, dries for upwards of 3 miles E. by N. and W. by S., and is  $1\frac{1}{4}$  miles across ; the highest part,  $3\frac{1}{4}$  miles N.N.E. of Cliff-end, is 5 feet above low-water at spring tides. From this, the sand extends  $4\frac{1}{4}$  miles both in an easterly and westerly direction ; the shallow patches to the westward having different names, viz. : the Hook, Last, and Woolpack, making the whole length of Margate sand 9 miles. On its north-east side is a beacon consisting of an iron cylindrical mast surmounted by two cones with the points together, the top about 33 feet above high water. From it Margate church (Trinity) is touching the east side of Margate jetty head S. by E.  $\frac{1}{2}$  E.; Margate Hook beacon open westward of Reculvers S.W. by W.  $\frac{3}{4}$  W.; Birchington church, S.S.W.  $\frac{1}{4}$  W.

**Buoys.**—The eastern extremity of Margate sand is marked by a *spherical* buoy painted in *red and white horizontal* stripes and surmounted with *staff and diamond* ; the south-eastern and southern sides by *two black conical buoys*.\*

**HOOK SAND** may be considered as a continuation of Margate sand, from which it is separated by a narrow passage, in which the the least depth is 10 feet at low-water, used sometimes by small craft. The highest part dries 5 feet at low-water. On its south edge is a beacon consisting of an iron cylindrical mast surmounted by an inverted cone, the top of which is 33 feet above high-water. From it, Birchington church bears S.E.  $\frac{2}{3}$  S.; St. Nicholas church S.  $\frac{1}{4}$  W.; and Herne high mill W. by S.  $\frac{1}{4}$  S.

**Buoys.**—The Hook is marked by South Margate, South spit, Hook spit, and East Last, buoys ; all of which are *conical black* buoys and define the north side of the Gore channel.\*

**CLIFF-END BANKS**, in the centre of the Gore channel, have 16 to 18 feet over them ; they lie about one mile off-shore, and are separated by a very narrow channel from the E.S.E. spit of the Hook, which is marked by South Margate buoy. The best track is to the southward of them, with Foreness in line with the outer end of Margate pier E. by S.  $\frac{2}{3}$  S.

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\* For positions of buoys, see Appendix to this chapter, pp. 348, 349.



**The LAST**, the western extremity of Margate sand, has a small patch, which dries at low water, on its shoalest part, N.E.  $\frac{1}{2}$  N. from Reculver,  $2\frac{3}{10}$  miles.

**Buoys.**—Three *black conical* buoys lie along the southern and south-western edges of the Last, and also mark the northern side of Horse channel.\*

**The EAST SWALE**, already noticed on page 32<sup>5</sup>, is the channel between the coast of Kent, near Whitstable, and the south-east side of the isle of Sheppey, whereby the traffic, consisting chiefly of coal and oysters, is carried on between Faversham and Whitstable in a small class of vessels. The Swale forms, however, a good shelter in north-east gales, and is a very safe place for a vessel without anchors to run for, as the ground may be taken in soft mud on the north shore inside Shellness, or, with greater safety and convenience, on the mud at Faversham creek. At Harty ferry, opposite Faversham creek, is a hard upon which vessels that have received damage may be laid for examination or temporary repair.

The approach between the Columbine and Whitstable flat is limited to a depth of 8 feet at low-water; therefore, care must be taken in not being too late on the ebb-tide or too soon on the flood when running for it.

Extensive flats occupy nearly the whole of the approach and entrance to the Swale, which are rendered irregular by the following banks and spits:—

**WHITSTABLE STREET**, on the south side of the entrance to the Swale, is a ridge of compact shingle and large boulders projecting in a N. by E. direction from the west end of Whitstable cliffs for one mile; its outer extremity, which dries, may be cleared by keeping Birchington church open of the Reculvers E.S.E., or Harty church in line with Shellness beacon W.  $\frac{1}{2}$  S. Its outer end is marked by a *can buoy, vertically striped red and white, with staff and cage*.\*†

**Pollard Spit.**—From Whitstable sand flats project towards Sheppey isle, named Whitstable flats; the outer part of these flats is named Pollard spit, which is also the south-eastern boundary of the East Swale. The outer end of Pollard spit is marked by a *red and white vertically striped can buoy*.\*

**COLUMBINE SAND** lies on the flat outside Shellness, and dries 2 feet at low water; it is marked by three *conical red* buoys

\* For positions of buoys see the end of this chapter, page 349.

† Directions for the East Swale are given on page 333.

moored on the north side of the channel of the East Swale, as follows,—the Columbine buoy, the Columbine spit buoy, and the Ham gat buoy.\*

**HORSE** is a shoal on the north side of the Swale,  $1\frac{1}{2}$  mile within Shellness; it dries 4 or 5 feet at low water. It is marked on its south-east side by a *red conical* buoy named Sand End.

**OVERLAND PASSAGE** extends from the West Last to the Nore; it is bounded on the north-east by the Spaniards, the Middle, and the Spile, and to the south-west by Columbine sand and the extensive flat which fronts the isle of Sheppey; there is as little as 6 feet depth in it at low-water upon the inner tail of the East Spaniard. To the westward of the Spaniard it is connected with Four-Fathoms channel.

**FOUR-FATHOMS CHANNEL**, so called from the depth in it at high-water, is bounded on the south by the Spaniards and the flat upon which they are based, and on the north by the Gilman, Middle, and Spile.

**SPANIARD** consists of two shoals, the Spaniard and East Spaniard. The Spaniard is three-quarters of a mile in length, E. by S. and W. by N., and the least water over it is 3 feet. The East Spaniard projects from the Sheppey flat 4 miles in an E.  $\frac{3}{4}$  N. direction, and has one patch on it dry at low water.

**Buoys.**—The northern limit of these shoals is indicated by three *can* buoys, which also mark the south side of Four-Fathoms channel, they are *black* and *white*, and the Eastern buoy is surmounted with a *staff* and *cage*.\*

**Spaniard Swatch** is the passage between the Spaniard shoals.

**GILMAN** is a narrow bank one and a half miles in length in an E. by N.  $\frac{1}{2}$  N. and W. by S.  $\frac{1}{2}$  S. direction, lying north one mile from the east end of the East Spaniard; there is a depth of 9 feet upon it, with Herne high and low mills in line. It is marked at its eastern end by a *black* and *white chequered can* buoy.\*

**MIDDLE** is an extensive sand drying one foot in patches, the general depths over it being 1 to 6 feet; it is 3 miles in length and one in breadth, and is marked on its south edge by a beacon, and on its south side by four *conical black* buoys,\* which buoys also mark the north side of the Four-fathoms channel.

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\* For positions of buoys see the end of this chapter, page 349, 350.

**Middle Beacon** is surmounted by a cage, 45 feet above low-water ; from it Monckton beacon appears just west of the Reculvers S.E. ; Whitstable high mill, nearly on with Whitstable coast-guard station, S.  $\frac{3}{4}$  W. ; and Herne mill, in line with Herne coast-guard station, S.S.E.  $\frac{1}{4}$  E.

**SPILE SHOAL**, to the west of the Middle, is 2 miles long in an east and west direction, and also dries in patches at low-water springs. Its south-west end is marked by a *black conical* buoy.\*

**CANT FLAT** extends in an easterly direction from the low north-west end of Minster cliffs, and carries general depths of 7 to 10 feet between one and  $2\frac{1}{4}$  miles off shore, but Cheney spit, with 6 feet on it, has the Nore light-vessel bearing N.N.E., one mile distant, and Sheerness Middle buoy (*black*), N.W. by N. half a mile.

To the eastward of this part of the Cant, and on the outer margin of the flat, is the East Cant, or Cant-edge shoal, marked by a *chequered black* and *white* can buoy, mentioned previously, pages 313 and 320.

**DIRECTIONS for South Channel.**—From off the North Foreland steer to the Northward and N.N.W., according to the distance off shore, to pass outside the Longnose buoy, taking care to keep North Foreland lighthouse open to the eastward of Neptune tower on Whiteness, bearing S. by W.  $\frac{1}{4}$  W., until Birchington church is open of Fort point, Margate, bearing W.  $\frac{1}{4}$  S. ; or, if at night, keep North Foreland light bearing S. by W.  $\frac{1}{4}$  W. until Margate pier *red* light opens to view, W.  $\frac{3}{4}$  S. ; a W. by N. course for 7 miles will then lead to the southward of the S.E. Margate, South Margate, and South spit buoys, passing over Cliff-end banks and through Gore channel, to one-quarter of a mile southward of the South spit buoy, from which position St. Peter's church, with a square tower, in Thanet, will be over the white coast-guard houses at Westgate bay, bearing S.E. by E. The best track, however, is to the southward of Cliff-end banks, keeping Foreness on with the end of Margate pile landing-pier, bearing E. by S.  $\frac{3}{4}$  S., until abreast South Margate buoy. In working Herne mill open north of Chislet mill will clear Nayland ledge, and Foreness well open of Fort point clears the projecting ledges between Margate infirmary and Cliff-end ; but the lead is the best guide, particularly if the weather be hazy, when it is more difficult to estimate the distance from the cliffs. From the above position near the South spit buoy, the course is N.W. by W.  $\frac{1}{4}$  W. for  $1\frac{1}{4}$  mile ; then W.N.W.

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\* For positions of buoys, see p. 351.

for  $1\frac{1}{2}$  mile through Horse channel, leaving the *conical black* buoys on the starboard hand and the *black* and *white can* buoys on the port hand. This channel is narrow and irregular in depth, and no good sailing or working marks can be given for it.

**CAUTION.**—Horse channel should not be navigated at night, as it is not lighted ; nor at low-water springs by vessels drawing more than 9 feet. Great attention must be paid to the period of tide and to the lead.

**DIRECTIONS.—From West Last buoy by Overland Passage.**—The course from one cable south of West Last buoy to one cable south of West Spaniard buoy is N.W. by W.  $\frac{1}{2}$  W. for 8 miles. In this track allowance must be made for the tidal stream, which runs in a westerly direction during the flood, and easterly during the ebb. This course passes one and a half mile north-east of Columbine buoy, and across a depth of 7 feet only upon the narrow ridge which connects the East Spaniard with the flat in front of Sheppey. It may be observed, as a guide to vessels bound up, that when Hook sand is covered, there are 11 feet in this passage. From one cable southward of West Spaniard buoy as above, steer N.W. by W.  $\frac{1}{2}$  W. for Spile buoy, and then N.W. for the Nore light-vessel, taking care to allow for a stream setting W.N.W. during the flood tide, and E.S.E. during the ebb.

**DIRECTIONS.—From West Last buoy through Four-Fathoms Channel.**—From the West Last buoy steer N.N.W.  $\frac{3}{4}$  W. for  $4\frac{3}{4}$  miles over the Kentish flats, which have in some places only 8 feet upon them, to East Spaniard buoy, making allowance for the stream which sets nearly abeam. Pass close to the northward of East Spaniard buoy, and steer W. by S.  $\frac{1}{4}$  S. for 2 miles, and then W. by N.  $\frac{1}{2}$  N. for  $2\frac{3}{4}$  miles ; this will lead between the Spaniard and Middle shoals, leaving the *conical black* buoys on the starboard hand, and the *black* and *white can* buoys on the port hand ; thence a W.N.W. course north of the town of Sheerness, for  $1\frac{3}{4}$  miles, leads one cable to the southward of the Spile buoy, having passed which, alter course to N.W. for the Nore light-vessel.

**DIRECTIONS.—From West Last buoy into the East Swale.**—From West Last buoy the direct course for the Swale is W.  $\frac{3}{4}$  N. to Whitstable Street buoy, but as this leads close to some 5-feet patches, it is necessary to keep farther out when the tide is low, by steering W. by N.  $\frac{3}{4}$  N. until Shellness coast-guard houses

appear midway between Harty church and the fishery beacon upon the ness, bearing W. by S.  $\frac{1}{4}$  S., and proceed with them so into the Swale towards Shellness, passing to the southward of the *conical red* buoys on the Columbine shoal, and northward of the *red* and *white can* buoys on Whitstable Street and Pollard shoals. When near Pollard buoy, a S.W. by W.  $\frac{1}{2}$  W. course, keeping Shellness on the starboard bow, will lead inside, where anchorage may be taken as convenient.

**DIRECTIONS.—From the Nore outwards by South Channel.**—When at the Nore, it will very much depend upon the period of tide, and the force and direction of the wind, as to which channel a vessel should take. If the tide is more than half-flood, with a leading wind, the Overland passage or Four-Fathoms channel may be selected as being the shortest route. Steer S.E. from the Nore light-vessel, which course for 4 miles, allowing for the stream setting on the port bow with the flood tide, and on the starboard quarter with the ebb, will lead to the Spile buoy, thence proceed by the Overland passage, S.E. by E.  $\frac{1}{2}$  E. for 10 miles, to one cable south of West Last buoy, then through Horse channel to one-quarter of a mile southward of South spit buoy, when an E. by S.  $\frac{1}{4}$  S. course may be steered down South channel and through Margate road. Keep three-quarters of a mile off shore below Margate, and when North Foreland lighthouse bears S. by W.  $\frac{1}{4}$  W., a S.S.E.  $\frac{3}{4}$  E. course will clear all dangers.

**ANCHORAGES.**—In the foregoing channels the following anchorages are generally used :—

**Westgate Road** affords good shelter in gales from the south-west and south-east, and is partly protected from northerly winds by Margate sand. The best anchorage is in 6 fathoms, sand and mud, with Minster mill in line with the west cliff of Westgate bay, and Foreness open of Margate pile landing pier.

**The Gore**, or “Under the Hook,” as it is frequently termed, is a roadstead much used by small vessels. The Hook and Margate sands give protection and break the sea in north-east gales, and during the time these shoals are uncovered (which is eight hours in every twelve) the water is smooth. Anchorage may be taken in any convenient position to the southward of Hook sand, with Monckton beacon in line with Upper Hale grove, bearing S.  $\frac{1}{2}$  E., or at about one-quarter mile south of the Hook buoys.

**Off Whitstable.**—If bound to Whitstable harbour and obliged to wait, a vessel should anchor in Fisherman's Hole, off the Street, keeping Shellness coast guard midway between Harty church and Shellness beacon W. by S.  $\frac{1}{2}$  S.; and Whitstable buoy, W.S.W., one mile. A small black buoy is at times kept here by the fishermen.

**East Swale.**—If obliged to anchor outside, a vessel drawing more than 10 feet will find a good berth in 16 feet, clay, close to the southward of Columbine spit buoy.

The general anchorage of the East Swale is very safe and good, in  $3\frac{1}{2}$  fathoms, at about one-quarter of a mile inside Shellness, at any convenient distance off shore.

**Four-Fathoms Channel.**—In the east end of this channel, between the East Spaniard and East Middle buoys, vessels of 13 to 14 feet draught will find anchorage; but to the westward of the Middle Spaniard there is not generally depth for a vessel drawing more than 10 feet. If drawing as much as 11 or 12 feet, and it be necessary to anchor, the best berth is at 2 cables to the south-west of the South Middle or Spile buoys.

#### QUEEN'S, PRINCE'S, ALEXANDRA, AND DUKE OF EDINBURGH CHANNELS, OAZE DEEP, AND KNOB CHANNEL.

**QUEEN'S CHANNEL** is formed between Margate sand and the Wedge to the southward, and Tongue and Pan sands to the northward. Margate sand, and the objects marking its east and southern sides, have been described on page 329; its north-eastern limit is indicated by two *can* buoys, painted *red and white*\*, in addition to the beacon described on page 329.

**WEDGE** is a ridge with 24 feet water over it, detached from the North spit and north side of Margate sand by depths of 5 and 6 fathoms.

**Buoy.**—The Wedge is marked by a *red and white vertically striped can* buoy.\*

**SOUTH KNOLLS** are several distinct sand ridges on the eastern side of the Kentish flats to the north-west of Margate sand having 12 to 17 feet, and strong tide ripples, over them.

**Buoy.**—A *chequered red and white can* buoy\* lies just to the eastward of the South knolls.

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\* For positions of buoys, see the end of this chapter, p. 351.

**TONGUE RIDGE and PAN SANDS** are the shoal patches on a shallow ridge which mainly separates Queen's and Prince's channels ; the ridge lies in an E. by S. and W. by N. direction, 7 miles in length, from a depth of 4 fathoms on the east extremity to a depth of 2 fathoms on the west extremity, and nearly a mile across at its widest part ; a portion of the Tongue sand dries at low water, the least depth on the Ridge and Pan sands is one foot. The Pan-sand ridge is irregularly formed ; in its vicinity ancient pottery remains are sometimes dredged up, which seems to indicate that the coast of Kent at one time extended out to these ridges. The Tongue, Ridge, and Pan sands are marked by four *red conical* buoys on the southern side ; by four *can* buoys, *black* and *white chequered*, and *black* and *white striped*, on their northern side ; whilst at the eastern end is a *spherical* buoy, *striped horizontally red* and *white* ; and at the end of the Tongue knoll another *spherical* buoy, *striped horizontally black* and *white*.\* There is also a beacon on the south side of the Pan-sand ridge. The space included between Pan sand and South knolls is called Pan-sand Hole.

**Pan-sand Beacon**, black, surmounted by a cage, 44 feet above low-water, stands on the south part of the sand. The marks for it are St. Peter's church, in line with Margate infirmary, bearing S.E.  $\frac{1}{4}$  S. ; and Hillborough church, in line with Bishopstone coast-guard house, S. by W.  $\frac{1}{4}$  W.

**PRINCE'S CHANNEL** is bounded on the south by the Tongue ridge and Pan sands (already described), and the northern edge of the Kentish flats, and on the north by Shingles and Girdler sands. This channel is lighted by three light-vessels, as well as marked by beacons and buoys, the least depth of water in it being 17 feet, or 5 feet greater than in Queen's channel and over the Kentish flats. It is the only channel on the south side of the Thames which can be used at night. From its eastern half, the Alexandra channel, the least depth in which is 23 feet at low-water, leads between the Girdler and Shingles sands to the Oaze deep ; but this is not lit, although well buoyed, and is consequently only available in daylight.

**SHINGLES SAND**, consisting of the South and North Shingles, and East Girdler, occupies a length of  $5\frac{1}{2}$  miles, in a W. by N. and S. by E. direction, and is 3 miles broad. It is bounded on the east by the Duke of Edinburgh channel ; on the north by the Black

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For positions of buoys, see pp. 351, 352.

deep ; on the west by the Alexandra channel, and on the south by the Prince's channel. Large portions of the sand dry at low-water. It is marked by beacons on its north and south extremes, and by numerous buoys, the character of which depends on the channel they are intended to mark.\*

**Shingles South Beacon**, black, with a diamond-shaped head, elevated 45 feet above low-water, is erected on the southern side of the sand, from it St. Peter's church is one-third from Margate mills towards Margate new church, bearing S. by E.  $\frac{3}{4}$  E. ; Chislet mill is in line with the coast-guard station at Reculvers, S.W.  $\frac{3}{4}$  S. ; Shingles spit buoy, S.W. by W.  $\frac{1}{4}$  W.,  $5\frac{1}{2}$  cables ; and N.E. Tongue buoy, S.  $\frac{3}{4}$  W.,  $1\frac{1}{10}$  miles.

**Shingles North Beacon**, erected on the northern part of the Shingles sand, is an iron cylindrical pillar, surmounted by a St. Andrew's cross, 30 feet above high-water, the whole painted black. From it Shingles south beacon appears nearly midway between Minster mill and Quex spire, S.  $\frac{1}{4}$  W. ; Pan-sand beacon, S.W.  $\frac{3}{4}$  W.,  $5\frac{4}{10}$  miles ; New Girdler beacon, S.W. by W.  $\frac{1}{3}$  W.,  $3\frac{6}{10}$  miles.

**GIRDLER.**—The Girdler is continually undergoing change ; it is now divided into two portions, East and West Girdler. The former sand forming a part of the Shingles just described. The West Girdler,  $3\frac{1}{2}$  miles long and half a mile broad, runs parallel to the south-western side of the Shingles sand, Alexandra channel dividing the two ; the latter shoal also forms the north-western boundary of Princes' channel. Two light-vessels, a beacon, two *black conical* and one *black and white spherical* buoys mark the south side of West Girdler.\*

**Girdler Beacon** stands to the south-westward of the dry portion of West Girdler ; it has a triangular head 45 feet above the level of low-water. From it St. Peter's church tower is open to the eastward of Margate old church, bearing S.S.E.  $\frac{3}{4}$  E. ; Birchington west mill is in line with the east end of Cleve wood, S. by E.  $\frac{1}{4}$  E. In consequence of alterations in the formation of the sand, a new beacon has been erected  $1\frac{1}{2}$  cables N.E.  $\frac{1}{4}$  N. of the old beacon, which still remains. It consists of an iron cylindrical mast, painted black, surmounted by a cone, point upwards, 33 feet above high water. From it Pan-sand beacon is in line with the old Girdler beacon, S.W.  $\frac{3}{4}$  S. ; North Shingles beacon, N.E. by E.  $\frac{1}{3}$  E. ; and South Shingles beacon, E. by S.  $\frac{1}{4}$  S. Should the old beacon be undermined and destroyed, it will not be replaced.

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\* For position of buoys, see page 353, et seq.



## PRINCE'S CHANNEL LIGHT-VESSELS.

**TONGUE LIGHT-VESSEL**, at the eastern entrance to Prince's channel, is moored in 10 fathoms off the north side of the ridge of Tongue sand, and one mile north of the fairway in Queen's channel. She exhibits a *double-flashing light*, giving one *red* and one *white* flash, in quick succession, every half minute. The light is 40 feet high, and should be seen in clear weather 11 miles.

**Fog Signal.**—In foggy weather a siren gives *three blasts*, in quick succession, *every two minutes*, in the following manner: The first blast a *high note*, the second a *low note*, and the third a *high note*.

The vessel lies with Minster mill just open westward of the east cliff, Westgate bay, bearing S. by W. ; Margate old church tower open to the eastward of Margate harbour lighthouse, S.  $\frac{1}{2}$  E. ; South Shingles beacon, N.W.  $\frac{3}{4}$  W.,  $2\frac{1}{10}$  miles ; East Tongue buoy, South 3 cables ; N.E. Spit buoy, S.E.  $\frac{1}{2}$  E., 4 miles ; Prince's channel light-vessel, W. by N.  $\frac{3}{4}$  N.,  $4\frac{1}{10}$  miles ; Girdler light-vessel, W. by N.  $\frac{1}{2}$  N.,  $8\frac{1}{2}$  miles ; and Tongue-knoll buoy, E.  $\frac{1}{2}$  S., 2 miles.\*

Vessels should pass to the northward of the light-vessel.

**PRINCE'S CHANNEL LIGHT-VESSEL** lies in 8 fathoms on the north side of the middle part of the Prince's channel, off the south-east spit of the West Girdler, and exhibits a *red* light, which revolves *every twenty seconds*, at 35 feet above the water, visible in clear weather at the distance of 10 miles.

**Fog Signal.**—A gong is sounded during thick or foggy weather.

From the vessel, St. Peter's church is between Margate harbour lighthouse and Margate old church, bearing S.S.E.  $\frac{1}{2}$  E. easterly ; Minster mill, its apparent length to the eastward of Quex spire, S. by E. ; Monkton beacon, in line with the east side of Upper Hale grove, and between St. Nicholas coast-guard houses, South ; Girdler Spit buoy, North, distant 4 cables ; Girdler light-vessel, W. by N.  $\frac{1}{2}$  N.,  $4\frac{2}{10}$  miles ; Tongue light-vessel, E. by S.  $\frac{3}{4}$  S.,  $4\frac{2}{10}$  miles ; Shingles Spit buoy, E. by S.,  $1\frac{2}{10}$  miles ; and S.E. Girdler buoy, W.N.W. 7 cables.\*

Alexandra channel is to the northward of this light-vessel.

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\* Towards the end of 1889, it is intended to move *Tongue light-vessel* about two miles eastward. Tongue knoll buoy will then be withdrawn ; also, *Prince's Channel light-vessel* will be moved about two miles eastward, and the *Shingles spit buoy* withdrawn. A *bell* gas buoy will be substituted for S.E. Girdler buoy, and gas buoys for Knock John and Knob buoys.

**GIRDLER LIGHT-VESSEL** is moored in 19 feet, at 5 cables to the south-west of the western spit of Girdler sand, and serves to mark the north-west entrance to Prince's channel. The vessel exhibits a *white* light, revolving *every half minute*, at an elevation of 36 feet above the sea, visible in clear weather at the distance of 10 miles.

**Fog Signal.**—A gong is sounded during thick or foggy weather.

From the vessel, the west end of Cleve wood is just open westward of St. Nicholas east coast-guard station, bearing S.S.E.  $\frac{1}{4}$  E.; Northdown tower is nearly in line with Pan-sand beacon, S.E.; East Spaniard buoy, S.W.  $\frac{3}{4}$  W., distant  $1\frac{2}{10}$  miles; Gilman buoy, W.  $\frac{3}{4}$  N., 7 cables; Shivering sand buoy, N. by W.  $\frac{1}{4}$  W.,  $1\frac{1}{4}$  miles; Knob buoy, N. by E.  $\frac{1}{2}$  E.,  $1\frac{3}{4}$  miles; West Girdler buoy, N.E. by E.  $\frac{3}{4}$  E., 4 cables; South Girdler buoy, E.  $\frac{3}{4}$  S.,  $1\frac{7}{10}$  miles; North Pan-sand buoy, S.E.,  $1\frac{8}{10}$  miles; and West Last buoy, S. by E.,  $5\frac{1}{4}$  miles.

Girdler light-vessel having been moved to the south-westward of her original position on the west spit of the sand, and West Girdler buoy placed there, she now covers a 17-feet patch; and the deepest water being in the channel between the above buoy and the vessel, it is necessary to pass to the north-eastward of her.

**Buoys.**—In addition to the above light-vessels and beacons, the Prince's channel is marked by four *can black* and *white* buoys on the north side of the Tongue sand, by three *black* and one *red* conical buoys on the south side of the Girdler and Shingle sands, and by a *black* and *white spherical buoy*, with *staff* and *triangle* on the south west-end of Girdler. The conical buoys are to be passed on the starboard side in entering and the can buoys on the port side.\*

**ALEXANDRA CHANNEL** is of comparatively recent formation, and separates the Shingles and the East Girdler sands from the West Girdler sand. It is narrow, only 2 cables wide, and somewhat irregular in depth at its inner or north-west end, but as it admits of a nearly straight course being steered from Tongue light-vessel to Mouse light-vessel in the West Swin, it is particularly convenient for steam-vessels, and for sailing vessels with a leading wind, although too narrow for a vessel of burden to work in. The least depth in it at low water is 23 feet. It is marked by 5 *red conical* buoys on its north-eastern side and on the south-west side of the Shingle sand; and by 5 *red* and *white can* buoys on its south-west side, and on the north-east side of the west Girdler sand.\*

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\* For positions of the buoys, see the end of this chapter, pp. 353 and 354.

**DUKE OF EDINBURGH'S CHANNEL**, formerly known as the Bullock channel, between the south-west end of Long sand and the East Girdler, leading from the eastern end of the Prince's channel to the Black deep or Knob channel, has been gradually increasing in capacity for some years, until it has become by far the most capacious of the eastern channels into the Thames, being over one mile wide, with 6 to 9 fathoms in it generally. It is however encumbered by a shoal of 22 feet in mid channel, called Shingles patch, which is one mile in length, and half a mile wide. This patch, which has grown up since 1882, divides the channel into two passages, the eastern of which is half a mile in width. The large vessels now proceeding into the Thames and Medway has rendered it necessary to buoy this approach and consequently it was marked in 1882, and has since been used extensively by large vessels of war. It is marked according to the uniform system of buoyage, *i.e.*, with 4 *black conical* buoys, on the starboard side in entering and 3 *black and white can* buoys on the port side, besides a *black and white spherical* buoy at the east end of the Shingles, marking the division between Prince's and Duke of Edinburgh channels. It is not yet lit and is consequently only available by day.\*†

**KNOB CHANNEL** is the western end of the Black deep and leads from the Duke of Edinburgh channel to the Oaze deep and West Swin. It is formed between the Shingles and Girdler sands to the south-eastward and the Knock John and Knob sands to the north-westward; and is marked by 5 *black conical* buoys on the starboard side in entering, and by 3 *black and white can* buoys on the port side.\*

**KNOB SHOAL** lies to the north-east  $1\frac{1}{4}$  miles from the east end of Shivering sand. The least water upon the Knob is 24 feet; it is of irregular form, several projections extending for about half a mile from it, with depths varying from 24 to 30 feet upon them. A narrow 19-foot ridge also exists one mile to the eastward of the Knob. Knob and East Knob shoals are together (within a depth of 30 feet)  $2\frac{3}{4}$  miles long in an east and west direction with a mean breadth of 2 cables. Their south edge is marked by two *conical black* buoys

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\* For position of buoys, *see* p. 355.

† Towards the end of 1889, it is intended to place a light-vessel named *Edinburgh Channel* near the present position of S.W. Long Sand buoy, which will then be withdrawn; also a light-vessel named *Black Deep* will be placed about midway between West Long Sand and East Knock John buoys; and a gas buoy will be substituted for the present N.E. Shingles buoy.

in connection with the buoyage of the Duke of Edinburgh channel. The marks for these buoys are given on p. 355.

**NORTH KNOB** is a shoal of comparatively recent formation, with 17 feet over its eastern end, and 6 feet over its centre, and from thence curving to the W.N.W.; its whole length being 2 miles.

**Buoy.**—The western end of the North Knob is marked by a *black conical* buoy, in 36 feet.\*

**BARROW DEEP** is to the northward of the Knob channel. Here 4 *green* and 4 *green and yellow vertically striped* buoys have been placed for the guidance of the sewage sludge vessels discharging their cargoes. *These buoys not being navigational buoys, further notice regarding them is not required.*

**OAZE DEEP** is formed between Shivering and Red sands, Spile, and East Cant shoals to the southward, and Oaze sand to the northward. It is  $1\frac{1}{4}$  miles wide at the eastern entrance, but narrows to half a mile to the westward, and the depths in mid-channel are from 7 to 11 fathoms at low water. This is a more direct passage to the Nore than through the western part of the Knob channel and West Swin, and since it has been buoyed has almost superseded the latter by day.

**SHIVERING SAND** has its eastern extremity, (which is marked by a large *bell* buoy,\* painted in *black and white vertical stripes*, with *staff* and *cage*, in  $5\frac{1}{4}$  fathoms,) one mile to the north-west of the west end of the Girdler; it is, practically, a continuation of Red sand, but its ridge is separated from that of the latter sand by a narrow swatchway; its width is half a mile, and the depth upon it has increased to 17 feet.

**RED SAND and SPILE** occur in continuation of Shivering sand for more than 6 miles, to where they meet Four-fathoms channel, and where the Spile *black* buoy is placed. Red sand and Spile dry in patches.

**Buoys.**—A *black and white vertically striped can* buoy lies at the east end, and a *black and white chequered can* buoy off the north side, of Red sand; and a *black and white vertically striped can* buoy to the north-east of the Spile.\*

**EAST CANT**, or Cant-edge shoal, lies on the extreme outer edge of the southern flat, and has a narrow patch with only 5 feet upon it. A *chequered black and white can* buoy marks its north side.\*

**OAZE** is a sand-bank lying nearly parallel to Red sand, and between Oaze and Barrow deeps. It is 4 miles long, from depths of

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\* For position of the buoys, see the end of the chapter, p. 356.

4 fathoms at each end, by half a mile wide ; and depths of 4 to 6 feet prevail over a space of  $1\frac{1}{2}$  miles.

**Buoys.**—The following buoys mark the Oaze sand :—A *black and white horizontally striped* buoy, *lighted by gas*,\* which shows an *occulting* light, is placed on the eastern extremity ; a *black and white horizontally striped spherical* buoy with *staff* and *triangle* on the west end ; a *black and white vertically striped can* buoy on the north side ; and a *black conical* buoy nearly midway along the southern side.

Mouse sand and light-vessel, with the buoys on the south side of the navigation from thence to the Nore, and Nore light-vessel have been described on pages 312, *et seq.*

**ANCHORAGES.**—In the space contained in the channels described in this section, it is customary in moderate weather for vessels to anchor in any position to await the tide ; the following anchorages, however, are those usually occupied :—

**Queen's Channel.**—At half a mile to the southward of the Wedge buoy shelter will be afforded by Margate sand in southerly winds.

**Pan-Sand Hole.**—There is anchorage in 30 to 33 feet midway between Pan-sand beacon and South Knoll buoy. Vessels drawing 24 feet should anchor between the Wedge and Pan Patch buoys, and not to the north-westward of South Knoll buoy. This was formerly the anchorage for large ships waiting for sufficiently high tides to admit of their crossing the Flats, but since the opening of Prince's channel it has not been required for that purpose.

**Prince's Channel.**—The best anchorage is between Girdler beacon and the north-west part of Pan sand, where the sands afford much shelter when the tide is low and the sea breaks upon them.

**The Knob** anchorage is a space to the northward of the Girdler and eastward of Shivering sand buoy, and is the proper anchorage for vessels detained by want of water to cross the Flats, set of tide, or other circumstances. Westerly gales are severely felt here, and should a vessel part her cables, it will be advisable to anchor under the dry patches of the Girdler, as affording the best shelter.

**The Warp** is a narrow bank of 6 fathoms, East  $3\frac{1}{2}$  miles from Nore light-vessel, and commonly used as an anchorage.

**DIRECTIONS for Queen's Channel and over the Flats.**—In all the channels it is necessary to remember that in proceeding

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\* For position of buoys, *see* page 357.

inwards from the sea towards the river Thames, the *conical* buoys of *one colour* should be passed on the starboard hand, and the *can* buoys of *two colours* on the port hand. Being off the North Foreland outside the Elbow buoy, steer N. by W. for 6 miles, to sight the East buoy of Margate sand, allowing for the tidal stream setting abeam; should there be any difficulty in sighting the buoy, or if it be gone, be careful to keep North Foreland light-house open to the eastward of Neptune tower, bearing S. by W., until the water deepens to 9 fathoms, or N.E. Spit buoy has been passed three-quarters of a mile, when Queen's channel will be open. From this, a W. by N. course for 8 miles leads through Queen's channel to about one-third of a mile south of Pan Patch *conical red* buoy, passing one-third of a mile to the northward of Margate North Spit *can* buoy, more than half a mile to the northward of Wedge *can* buoy, and nearly the same distance to the southward of West Tongue *conical* buoy. From abreast Pan Patch *conical* buoy, the course through Pan-sand Hole to West Pan-sand buoy, is W.  $\frac{1}{2}$  N., and the distance about  $2\frac{1}{4}$  miles; Pan-sand Spit *conical* buoy and beacon being to the northward, and South Knoll *can* buoy to the southward. Now steer N. by W.  $\frac{1}{2}$  W., making allowance for the cross stream, for  $2\frac{1}{2}$  miles over the Kentish Flats, to abreast Girdler light-vessel, observing that in this track there is an average depth of only 13 to 14 feet at low water.

If bound to the East Swale from Queen's channel, a course according to position must be shaped for Whitstable Street *can* buoy, which, from the neighbourhood of Pan-sand huoy, would be about W. by S.  $\frac{1}{8}$  S., and the distance 7 miles, and when the Street buoy has been sighted proceed by the directions on page 333.

**DIRECTIONS for Prince's Channel.**—Having arrived at the entrance to Queen's channel off N.E. Spit buoy, as already directed, steer N.W.  $\frac{1}{2}$  W., allowing for the tide-set, for Tongue light-vessel, distant about 4 miles, leaving East Tongue buoy 3 cables on the port hand. Pass to the northward of Tongue light-vessel; thence a W. by N.  $\frac{1}{2}$  N. course for  $8\frac{1}{4}$  miles will lead to the Girdler light-vessel, passing the Shingles and Girdler beacons, the Prince's light-vessel and the *conical* buoys marking the north side of the channel on the *starboard hand*, and the *can* buoys and Pan-sand beacon marking the south side of the channel on the *port hand*. Girdler light-vessel should be approached so as to be passed on her north side, between the vessel and West Girdler buoy, where there is the deepest water.

**CAUTION.**—In shaping a course from Tongue light-vessel through Prince's channel on the last of the ebb, or during the first-quarter flood, care must be taken to allow for a tidal stream setting to the southward.

**DIRECTIONS for Alexandra Channel.**—As remarked on page 339, Alexandra channel offers the advantage of a nearly straight course between Tongue and Mouse light-vessels, but not being lighted, it is not available for night navigation. Having passed to the northward of Tongue light-vessel, steer W. by N.  $\frac{3}{4}$  N. about  $2\frac{1}{2}$  miles for Prince's channel light-vessel, or until South Shingles beacon bears N.E.  $\frac{3}{4}$  E. when a N.W.  $\frac{3}{4}$  W. course for  $4\frac{1}{2}$  miles will lead through Alexandra channel between the *red conical* buoys of the Shingles to the north-eastward, and the *red and white striped* Girdler *can* buoys to the south-westward, to North-west Shingles *spherical* buoy; when, a N.W. by W.  $\frac{1}{2}$  W. course continued for  $4\frac{1}{2}$  miles farther, will carry through Knob channel to a position from whence a course up the West Swin may be shaped. As before observed, Alexandra channel is too narrow for a vessel of burden to work in.

**DIRECTIONS from the Girdler to the Nore, through Oaze Deep.**—The course from Girdler light-vessel to round Shivering sand buoy is North, and the distance to be run  $1\frac{1}{2}$  miles, making due allowance for a tide stream setting abeam. From abreast Shivering sand buoy, steer W.  $\frac{1}{4}$  N. for  $5\frac{1}{2}$  miles, which will lead through Oaze deep to one-quarter of a mile south of West Oaze buoy; then steer W. by N.  $\frac{1}{2}$  N. for the Nore, passing to the northward of Cant buoy.

**At night**, when rounding the west spit of the Girdler and east extremity of Shivering sand, Maplin light, which in all other directions shows *red*, will in this direction, or between the bearings N.  $\frac{1}{3}$  E. and N. by E., be seen *white*, as described on page 311; consequently, neither of these shoals should be approached so near as to change the colour of the light to *red*.

**DIRECTIONS through Duke of Edinburgh and Knob Channels.**—From the north-eastern Spit buoy of the Margate sand a N.N.W. course for 5 miles leads to the entrance of the Duke of Edinburgh channel: then steer N.W.  $\frac{1}{2}$  N. for  $1\frac{1}{2}$  miles, and then N.W. by W. for 2 miles, which will lead to the eastward of the Shingles patch and into the Knob channel, leaving the *black conical* buoys on the south-west end of the Long sand on the starboard side,

and the *black* and *white can* buoys on the north-east side of the Shingles patch on the port hand. From this position (North half a mile from North Shingles beacon) a W.  $\frac{1}{4}$  S. course for 7 miles leads to the Shivering sand buoy, between the Shingles sand to the southward (the north-west edge of which is marked by *black* and *white can* buoys) and the Knock John and Knob shoals to the northward, the south-east edges of which are marked by *black conical* buoys.

From abreast Shivering sand buoy, steer about N.W. for 2 miles in the direction of Mouse light-vessel, to abreast East Oaze buoy, allowing for the stream setting nearly abeam. A vessel in this track will pass one mile to the south-westward of the black conical buoys on the west end of the Knob shoals, and in working they will serve her as a guide when to tack. Having passed East Oaze buoy, continue on the same course towards Mouse light-vessel for three-quarters of a mile farther, when the fairway will be reached, and a West (southerly) course for 8 miles will lead to the Nore light-vessel. If the wind be south-west, and it should be desirable to keep to windward, haul up as soon as the water deepens to the northward of East Oaze buoy, when W.  $\frac{1}{2}$  N. will clear the sand ; which is marked on its north side by a *black* and *white vertically striped* can buoy. The least depth in the Duke of Edinburgh and Knob channels is 36 feet at low-water.

**DIRECTIONS from the Nore outwards by Knob Channel.**—Being one-quarter of a mile or less to the Northward of Nore light-vessel, steer East for the fairway between Mouse light-vessel and East Oaze buoy. When Mouse light-vessel bears N.W.  $\frac{1}{2}$  W., proceed with it on that bearing and with Girdler light-vessel broad on the starboard bow, passing to the eastward of East Oaze and Shivering sand buoys, and when Girdler light-vessel bears South, steer for, but pass to eastward of her, if bound through Prince's channel ; but if for the Duke of Edinburgh channel, steer E.  $\frac{1}{4}$  N. for nearly 7 miles, and then through the channel to the eastward of Shingles patch and towards the Tongue Knoll buoy.

**At night,** Maplin light appearing *white* will insure being clear to the eastward of Shivering sand, when Girdler light-vessel may be immediately steered for keeping within the limits of Maplin white light.

**DIRECTIONS outwards through Oaze Deep.**—From abreast Nore light-vessel as before, an E. by S.  $\frac{1}{2}$  S. course for  $4\frac{3}{4}$  miles



allowing for the flood stream setting on the port bow, will lead north of Cant buoy to about one-quarter of a mile south of West Oaze buoy ; thence the course through the deep is East, and the distance  $5\frac{3}{4}$  miles, passing one and half cable to the northward of Shivering sand buoy, and when Girdler light-vessel bears South steer so as to pass to the eastward of her.

**DIRECTIONS outwards through Prince's Channel.—**

From between Girdler light-vessel and West Girdler buoy, steer an E. by S.  $\frac{3}{4}$  S. southerly course for 4 miles, which will lead south of Prince's light-vessel, then E. by S.  $\frac{1}{4}$  S., 4 miles leads through the fairway, to a position one and a half cables to the north-eastward of Tongue light-vessel ; from this steer S.E.  $\frac{1}{2}$  E. to clear the north-east spit of Margate sand, taking care to allow for the tidal stream, which on the flood sets towards the sand. When North Foreland lighthouse appears open to the eastward of Neptune tower bearing S. by W., a S. by E.  $\frac{1}{4}$  E. course will lead to the eastward of the Elbow buoy off the North Foreland, or a course may be shaped according to circumstances.

**At night**, on leaving Prince's channel, Tongue light should not be brought to the northward of N.W. by W.  $\frac{1}{4}$  W. until North Foreland light bears S. by W., on which bearing it must be remembered that the light changes from *white* to *red*, the eastern limit of the *red* light leading one cable eastward of East Margate buoy.

**Over the Flats and down Queen's Channel.—**From Girdler light-vessel, steer over the Flats S. by E.  $\frac{1}{2}$  E., for  $2\frac{1}{2}$  miles, allowing for the stream, to West Pan-sand buoy, then E.  $\frac{1}{2}$  S. for  $2\frac{1}{2}$  miles through Pan-sand Hole to abreast Pan Patch buoy. From this, the fairway course through Queen's channel is E. by S. which will lead half a mile to the northward of North Spit buoy, and about a mile to the north-eastward of North-east Spit buoy, when a S. by E.  $\frac{1}{4}$  E., easterly, course will clear the east spit of Margate sand, and lead to outside the Elbow buoy.

**CAUTION.—**If night is approaching when near the eastern part of Queen's channel, do not haul round Margate sand until North Foreland light bears S. by W. It must be remembered also that in this part of the channel the last of the ebb and first-quarter of the flood streams set between South and S.S.W. ; allowance should therefore be made for them in light winds, or with scant easterly winds.

**In working** through either of the foregoing channels, a look-out

for the buoys, beacons, and lights, with attention to their bearings and a judicious use of the lead, are the best directions, for the land is so distant that marks are, generally speaking, of little service.

**TIDES.**—It is high-water, full and change, at Pan-sand Hole, at 12h., and at the Nore at 0h. 30m. Off North Foreland the stream runs to the N.N.E. from about  $2\frac{1}{2}$  hours before, until  $3\frac{1}{2}$  hours after, high-water at Margate, and it commences running to the southward towards the Gull stream at about  $3\frac{3}{4}$  hours after high-water at Margate. Vessels should not leave Margate road to beat down until nearly half-ebb.

The first of the flood stream at the eastern end of Queen's and Prince's channels runs to the S.S.W., the first-quarter sets S.W., half-flood W.N.W., and for the last hour it sets to the N.W. The ebb begins setting to the N.E., and draws round to E.S.E. at half-ebb, and to S.S.E. and South in the last-quarter.

The general rate of the tidal streams is about  $2\frac{1}{4}$  knots during springs, and  $1\frac{1}{4}$  knot at neaps.

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## THAMES ESTUARY—PART III.

### BUOYS IN ESTUARY OF THE THAMES.

#### BUOYS IN THE SOUTHERN CHANNELS.

**Longnose** is a *can* buoy, painted in *black* and *white vertical stripes*, in 4 fathoms, at the extremity of Longnose ledge, with Margate old church in line with the northernmost of the two mills at Margate, W. by S.  $\frac{1}{4}$  S., and North Foreland lighthouse, S.  $\frac{1}{2}$  W.

**Reculver** is a *can* buoy *striped vertically black* and *white*, in 10 feet, with the flagstaff at Reculvers coast-guard station one-third from Reculvers towers towards a house on the high land with a chimney at each end, S.W.  $\frac{3}{4}$  W.; Monckton beacon, in line with the west end of Upper Hales Grove, S. by E.  $\frac{2}{3}$  E.

**Horse** is a *chequered black* and *white can* buoy, in 10 feet, on the Horse ridge, with Birchington church just open of the west end of trees at Lower Gore farm, S.E.  $\frac{3}{4}$  E. The chimney at Sarre mill in line with the east end of a long black shed on low ground eastward of the buildings at Reculvers, S. by E.  $\frac{1}{4}$  E.

**East Margate** is a *spherical* buoy, *striped horizontally red* and *white*, with *staff* and *diamond*, in 5 fathoms; with Margate old church spire, in line with the western chimney of Margate baths, bearing S.W.  $\frac{1}{4}$  S.; west end of Moro castle, in line with the centre of North Foreland lighthouse, S.  $\frac{3}{4}$  W.; Elbow buoy, S. by E.  $\frac{1}{4}$  E., 5  $\frac{6}{10}$  miles. The eastern limit of the *red* sector of North Foreland light passes one cable eastward of East Margate buoy.

**S.E. Margate** is a *black conical* buoy, in 4  $\frac{3}{4}$  fathoms, off the south spit of the sand; with Bishopstone east coast-guard house its length open north of Reculvers, bearing W.  $\frac{1}{4}$  N.; Quex spire near Birchington, on the west side of a block of two houses, S.S.W.

**South Margate** is a *black conical* buoy, in 4 fathoms, on the south edge of the sand; with Mount Pleasant, in line with Birchington west mill, bearing S.  $\frac{1}{3}$  E.; and St. Nicholas church, in

line with the west end of the western coast-guard house at St. Nicholas, S.W.  $\frac{3}{4}$  S.

**South spit** is a *black conical* buoy, in 34 feet, off the south spit of the sand, with Foreness just open of Margate jetty head, E. by S.  $\frac{3}{4}$  S., southerly ; Hook beacon, N.W.  $\frac{3}{4}$  N., 3 cables.

**Hook spit** is a *black conical* buoy, in 20 feet, with Congregational chapel spire, Margate, in line with Margate Hook beacon, S.E. by E.  $\frac{3}{4}$  E., and Birchington church just open westward of Cliffe end, S.E.  $\frac{1}{4}$  S. ; Hook beacon,  $4\frac{1}{2}$  cables.

**East Last** is a *black conical* buoy, in 10 feet, with Minster mill, in line with the easternmost house of St. Nicholas coast-guard station, bearing S.E. by S. ; and Chislet mill, in line with a small house to the eastward of Reculvers coast-guard house, S.W.  $\frac{3}{4}$  S.

**Middle Last** is a *black conical* buoy, in 10 feet with Margate Hook beacon, half its height, open northward of the houses on East Cliff, Margate, E.S.E. ; chimney at Sarre mill just open westward of the low west end of a clump of trees on the low land, S. by E.

**West Last** is a *black conical* buoy, with *staff and globe*, in 11 feet, with North Down tower in line with Margate Hook beacon, S.E. by E.  $\frac{1}{4}$  E. Sarre mill, in line with the east end of a long black shed on low ground eastward of the buildings at Reculvers, S. by E.  $\frac{1}{4}$  E.

**Whitstable Street** is a *red and white vertically striped can* buoy, with *staff and cage*, on the south side of the fairway to the East Swale, in 10 feet, nearly one mile to the northward of the extremity of the Street ; with Harty church in line with the northernmost house at Shellness, bearing W. by S. ; and Whitstable church tower open to the eastward of a white watch-house, S.  $\frac{1}{4}$  W.

**Pollard spit** is a *red and white vertically striped can* buoy, in 13 feet, with Harty church, in line with Bell's house, bearing W.  $\frac{3}{4}$  S. ; and a clump of trees on the west part of the high land of Sheppey, in line with the white end of the east Mussel-house, N.W. by W.

**Columbine** is a *red conical* buoy off the eastern shallow spit of the sand, in 7 feet, with Herne high mill just east of a large house at the inner end of Hampton oyster pier, S.E.  $\frac{3}{4}$  S. ; north end of Leysdown parsonage in line with Leysdown coast-guard flagstaff, W.  $\frac{3}{4}$  N., northerly.

**Columbine spit** is a *red conical* buoy, in 8 feet, near the east end of the sand, which dries at low water ; with Whitstable church,

in line with the "Pearson's Arms," bearing S. by E.  $\frac{1}{4}$  E. ; and Columbine buoy, E. by N.  $\frac{1}{4}$  N., one mile.

**Ham Gat** is a *red conical* buoy, in 6 feet, marking the narrow passage between the west end of the Columbine and the flat adjoining Shellness.

**Sand End buoy.**—A *red conical* buoy, lies in 7 feet, on the eastern edge of the Horse.

### BUOYS IN FOUR-FATHOMS CHANNEL.

**East Spaniard** is a *can* buoy, *striped vertically black and white*, with *staff and cage*, in 15 feet, with the east side of Herne high mill, midway between the clock tower, and low mill at Herne bay, bearing S.  $\frac{1}{3}$  E. ; Whitstable high mill, in line with the easternmost coke chimney at Whitstable, S.S.W.  $\frac{3}{4}$  W.

**Middle Spaniard** is a *chequered black and white can* buoy, in 13 feet, with the miller's house at Herne high mill, in line with the west end of the coast-guard station at Herne bay, bearing S.S.E.  $\frac{1}{2}$  E. ; and East Spaniard buoy, E.  $\frac{2}{3}$  N.,  $2\frac{7}{10}$  miles.

**West Spaniard** is a *can* buoy, *striped vertically black and white*, in 10 feet to the north-westward of the west end of the Spaniard ; with Minster mill, in line with the Reculvers, bearing S.E.  $\frac{1}{2}$  E. ; and Whitstable church tower, in line with the "Pearson's Arms," S. by E.  $\frac{1}{4}$  E.

**Gilman** is a *can* buoy, *chequered black and white*, in 19 feet on the east tail of the Gilman ; with Reculvers, its length eastward of Sarre mill, bearing S. by E.  $\frac{1}{2}$  E. ; and the east Coke chimney at Whitstable, nearly midway between the western chimney and Whitstable high mill, S.W. by S.  $\frac{1}{4}$  S.

**East Middle** is a *black conical* buoy, in 13 feet at low water, with Middle beacon W.  $\frac{1}{4}$  N. ; St. Nicholas church tower on with the east end of the first houses eastward of Reculvers coast-guard station, S.E. by S.

**South-East Middle** is a *black conical* buoy, in 14 feet, with Minster church, Sheppey just open north of East end lower coast-guard station, W.  $\frac{1}{2}$  N. ; Coke oven chimneys, S. by W.  $\frac{1}{2}$  W.

**South Middle** is a *black conical* buoy, in 12 feet, with the tree eastward of Herne mill, open west of Herne bay coast-guard station, S.S.E.  $\frac{2}{3}$  E. ; and Minster church, in Sheppey, W.  $\frac{1}{2}$  N.

**West Middle** is a *black conical* buoy, in 9 feet, with the west end of Cleve wood touching Reculvers, bearing S.E.  $\frac{1}{2}$  E. ; and Whitstable church tower, its breadth southward of the "Pearson's Arms," S. by E.  $\frac{1}{4}$  E.

**Spile** is a *black conical* buoy, in 12 feet, at the western extremity of Spile sand (described on page 332), with Leysdown church, bearing S. by W.  $\frac{1}{2}$  W. ; and Minster mill, Thanet, open to the southward of Reculvers, S.E.  $\frac{2}{3}$  E.

#### BUOYS IN QUEEN'S CHANNEL.

**N.E. Spit** is a large *can* buoy, *striped vertically red and white*, in  $7\frac{3}{4}$  fathoms, upon the north-east extremity of Margate sand ; with Neptune tower, in line with the chimney of the easternmost cottage at North Foreland lighthouse, S.  $\frac{1}{2}$  W. ; Minster mill, just open of the west end of the Chapel at Margate Sea Bathing Infirmary S.W.  $\frac{1}{4}$  S.

**North Spit** is a *chequered red and white can* buoy, in  $8\frac{1}{2}$  fathoms, on the steep edge of the North spit of Margate sand. From this buoy, St. Peter's church, near Broadstairs, appears in line with a gap in the cliff near Margate eastern coast-guard house, bearing S. by E. ; St. Nicholas church is in line with St. Nicholas easternmost coast-guard house, S.W.  $\frac{1}{4}$  S.

**Wedge** is a *can* buoy, *striped vertically red and white*, in 4 fathoms, off the north side of Wedge shoal ; with Minster mill, in line with the coast-guard house in Epple bay, bearing S.  $\frac{1}{3}$  E. ; and Monkton beacon, in line with the middle of Lower Hale Grove, S. by W.  $\frac{1}{4}$  W. ; North Margate beacon E. by S.  $\frac{1}{4}$  S., distant 2 miles.

**South Knoll** is a *chequered red and white can* buoy, in 16 feet, off the east side of South Knolls ; and from it, Margate mills are in line with Margate new church tower, bearing S.E. ; Minster mill and Birchington west mill are in line, S.S.E.

**Tongue Knoll** is a *spherical* buoy of large size, *striped black and white horizontally*, in  $5\frac{1}{2}$  fathoms, off the eastern extremity of the long spit from Tongue sand ; with Neptune tower, midway between the towers of Moro castle, bearing S.  $\frac{1}{2}$  E. ; and South Shingles beacon, W.N.W., 4 miles.

**East Tongue** is a *red and white horizontally striped spherical* buoy, in 4 fathoms, on the ridge of Tongue sand ; with St. Nicholas church just open to the westward of St. Nicholas western coast-guard

house, bearing S.W.  $\frac{3}{4}$  S. ; Minster mill, in line with the cliff on the east side of Westgate bay, S. by W.  $\frac{1}{4}$  W.

**West Tongue** is a *red conical* buoy, in 4 fathoms, with St. Peter's church open of the cliff to the westward of Margate new church, bearing S.S.E. ; Monkton beacon in line with the east side of Lower Hale grove, S. by W.  $\frac{1}{4}$  W.

**Pan Patch** is a *red conical* buoy, in 4 fathoms, off the south-east tail of Pan sand, upon which is a depth of 14 feet. From the buoy, Reading Street beacon and Margate new church are in line, bearing S.E.  $\frac{1}{3}$  S. ; Monkton beacon is in line with the west end of Upper Hale grove, S.  $\frac{1}{2}$  E.

**Pan-sand Spit** is a *red conical* buoy, in 4 fathoms, off the south-east spit of Pan sand, upon which is one foot of water ; with Quex spire, open to the westward of Birchington church spire, bearing S.S.E. ; Pan beacon, N.W.  $\frac{1}{2}$  W., 7 cables.

**West Pan sand**, is a *red conical* buoy, *with staff and globe*, in 12 feet, off the south-west spit of Pan sand ; with Birchington west mill, its height westward of Margate Hook beacon, S.E. by S., Pan-sand beacon, E. by N.  $\frac{1}{3}$  N.,  $1\frac{3}{10}$  miles.

### BUOYS IN PRINCE'S CHANNEL.

**Buoys on South Side.**—Tongue Knoll, and East Tongue buoys, to the eastward of Tongue sand, mark also the north side of the eastern entrance to Queen's channel. Their positions are given on page 351.

**N.E. Tongue** is a *black and white vertically striped can* buoy, in  $4\frac{1}{2}$  fathoms on the north-east side of the sand, and W. by N.  $\frac{1}{2}$  N. 2 miles from East Tongue buoy ; with St. Peter's church tower, in line with Margate' new church tower, bearing S.S.E. ; Monkton beacon, in line with the east end of Lower Hale grove, S. by W.  $\frac{1}{4}$  W. ; South Shingles beacon, N.  $\frac{3}{4}$  E., distant  $1\frac{1}{10}$  miles.

**North Tongue**, is a *black and white vertically striped can* buoy, *with staff and cage*, in 6 fathoms, close to the north-west of the shoalest part of the Tongue ; with Monkton beacon, just open to the westward of St. Nicholas eastern coast-guard station, S.  $\frac{1}{4}$  W. ; Pan-sand beacon, W.  $\frac{1}{2}$  S. distant  $2\frac{4}{10}$  miles.

**N.E. Pan-sand** is a *black and white chequered can* buoy in  $7\frac{1}{2}$  fathoms, close off the north side of Pan sand. From the buoy,

Northdown monument is over the chancel of Margate new church, bearing S.E.  $\frac{3}{4}$  S. ; and Girdler new beacon, N. by E.  $\frac{1}{2}$  E., one mile.

**North Pan sand**, is a *black and white vertically striped can* buoy, in 5 fathoms, half a mile to the northward of the west end of the sand, and near the eastern margin of the Kentish Flats ; with St. Peter's church, in line with Margate infirmary, bearing S.E.  $\frac{1}{3}$  S. ; Girdler new beacon, E.N.E.,  $2\frac{1}{10}$  miles.

**Buoys on North Side. S.E. Shingles**, is a *black conical* buoy with *staff and globe*, in 6 fathoms, off the south-east side of the Shingles ; with St. Peter's church, just open eastward of Margate eastern coast-guard station, S. by E. ; South Shingles beacon, W. by N.  $\frac{1}{4}$  N., distant  $1\frac{3}{10}$  miles.

**Shingles Spit**, is a *red conical* buoy, in 10 fathoms, off the south-western dry portion of the Shingles ; with Pan sand beacon W.  $\frac{3}{4}$  S ; South Shingles beacon, N.E. by E.  $\frac{1}{4}$  E.,  $5\frac{1}{4}$  cables.

Then occurs Prince's channel light-vessel, described on page 338.

**S.E. Girdler buoy**, is a *black conical* buoy in  $3\frac{1}{2}$  fathoms ; with South Shingles beacon E.  $\frac{3}{4}$  S. 3 miles ; and Girdler new beacon, N.N.W. 4 cables.

**South Girdler**, is a *black conical* buoy in 18 feet, upon a spit from West Girdler ; with Northdown monument, open to the eastward of Margate new church, bearing S.E.  $\frac{1}{2}$  S. ; and Herne high mill, over the end of the cliffs east of Herne bay, S. by W.  $\frac{3}{4}$  W.

**West Girdler**, is a *spherical* buoy, painted in *black and white horizontal bands* with *staff and triangle*, in 21 feet, immediately to the southward of the west spit of the sand ; with Mount Pleasant, midway between two coast-guard stations, bearing S.S.E.  $\frac{3}{4}$  E. ; Girdler light-vessel, W.S.W., distant 4 cables.

#### ALEXANDRA CHANNEL BUOYS.

**Buoys on S.W. side of Alexandra Channel.**—Prince's channel light-vessel lies close to the south-east point of the West Girdler, and thus serves as a divisional mark between Prince's and Alexandra channels.

**Girdler Spit**, is a *red and white vertically striped can* buoy, in  $5\frac{3}{4}$  fathoms, on the north-east side of the south-east spit of the West Girdler with South Shingles beacon E. by S.  $\frac{1}{8}$  S.  $2\frac{3}{10}$  miles ; North Shingles beacon N.E.  $\frac{3}{8}$  E.



**N.E. Girdler**, is a *red and white vertically striped can* buoy in 5 fathoms ; with Northdown tower over the East church at Margate, S.E. by S. ; and Reculver towers on with New Girdler beacon S. by W.

**Middle Girdler**, is a *can* buoy painted in *red and white vertical stripes* in 24 feet with west end of Bishopstone coast guard station touching Pan-sand beacon S. by W.  $\frac{1}{4}$  W. S. Shingles beacon S.E. by E.  $\frac{7}{8}$  E. distant 4 miles.

**Girdler Elbow**, is a *red and white vertically striped can* buoy, in  $5\frac{1}{2}$  fathoms ; with South Shingles beacon, S.E. by E.  $\frac{7}{8}$  E.  $4\frac{1}{2}$  miles ; and George's farm, open to the westward of Pan-sand beacon S.  $\frac{1}{8}$  W.

**North Girdler**, is a *red and white vertically striped can* buoy, in 5 fathoms, about midway along the north-west side of the West Girdler ; with North down tower, in line with Margate mills, bearing S.E.  $\frac{2}{3}$  S. ; and Herne mill, in line with the easternmost house at Herne bay, S. by W.  $\frac{1}{3}$  W.

**Buoys on N.E. side of Alexandra Channel.—Shingles Spit**, a *conical red* buoy, marking the north side of Prince's channel, and described on page 353, also marks the north-east side of the entrance to Alexandra channel.

**South Shingles** is a *red conical* buoy, in  $6\frac{1}{2}$  fathoms, N.W. by W., 8 cables from Shingles spit buoy ; with North Shingles beacon N.N.E.  $\frac{1}{2}$  E. ; South Shingles beacon E.  $\frac{3}{4}$  S.  $1\frac{1}{2}$  mile.

**S.W. Shingles** is a *red conical* buoy, in 5 fathoms ; with South Shingles beacon E.S.E.  $2\frac{1}{10}$  miles ; North Shingles beacon N.E.  $\frac{1}{2}$  E.

**Shingles Elbow** is a *red conical* buoy in  $5\frac{1}{2}$  fathoms ; with Pan-sand beacon, a little open west of the clock tower at Herne bay, bearing S.W. by S. ; South Shingles beacon S.E. by E.  $\frac{7}{8}$  E.

**West Shingles** is a *red conical* buoy, in 4 fathoms, with Minster mill midway between Quex spire and Birchington church, S. by E.  $\frac{1}{2}$  E. ; Middle ground beacon, its height on the east end of the trees at Warden point, W. by S.

**N.W. Shingles** is a *spherical* buoy, painted *red and white*, in *horizontal* bands and surmounted by a *staff and triangle*, in 7 fathoms, at the south-west spit of the East Girdler ; with North Foreland

lighthouse in line with Girdler old beacon, S.E.  $\frac{3}{4}$  S.; North Shingles beacon E.  $\frac{1}{2}$  N.

## DUKE OF EDINBURGH AND WEST CHANNEL BUOYS.

BUOYS ON THE STARBOARD SIDE OF THE DUKE OF EDINBURGH AND  
KNOB CHANNELS PROCEEDING UP THE THAMES.

**South Long-sand**, a *black conical* buoy with *staff and two globes*, is in 11 fathoms at low water, with Trinity church tower, Margate, its width open west of the tower of the Deaf and Dumb Asylum, S. by W.; South Shingles beacon W. by S.  $\frac{1}{4}$  S.

**South-West Long-sand**, a *black conical* buoy, lies in 7 fathoms, with North Shingles beacon W. by N.  $\frac{5}{8}$  N.,  $2\frac{3}{10}$  miles; South Shingles beacon S.W.  $\frac{5}{8}$  W.

**West Middle Long-sand**, a *black conical* buoy, lies in  $6\frac{1}{2}$  fathoms, with South Shingles beacon S.S.W.  $\frac{1}{4}$  W.; North Shingles beacon W. by S.  $\frac{1}{3}$  S.,  $1\frac{2}{10}$  mile.

**West Long-sand**, a *black conical* buoy, lies in  $6\frac{1}{2}$  fathoms, with North Shingles beacon three times its height open west of the South Shingles beacon, S.  $\frac{1}{3}$  W.; West Middle Long-sand buoy, S.E. by E.,  $1\frac{5}{10}$  mile.

**East Knock John** is a *black conical* buoy, with *staff and globe*, in 7 fathoms, with South Shingles beacon in line with Trinity church, Margate, S. by E.  $\frac{1}{2}$  E.; North Shingles beacon, S.E.  $\frac{1}{4}$  E.,  $1\frac{8}{10}$  miles.

**Knock John** is a *black conical* buoy, in  $6\frac{3}{4}$  fathoms, with Girdler old beacon in line with Reculvers, S. by W.; North Shingles beacon, E. by S.  $\frac{3}{4}$  S.,  $2\frac{3}{4}$  miles.

**East Knob** is a *black conical* buoy, in  $6\frac{3}{4}$  fathoms, with Pan-sand beacon in line with the Reculvers, S.  $\frac{1}{4}$  W.; North Shingles beacon, E.  $\frac{3}{4}$  S.

**Knob** is a *black conical* buoy, in  $5\frac{1}{2}$  fathoms, with Maplin lighthouse North (easterly),  $4\frac{2}{10}$  miles; East Knob buoy E.  $\frac{3}{4}$  N.,  $1\frac{8}{10}$  mile.

**North Knob** is a *black conical* buoy, in 36 feet, with Northdown tower on with Margate mills, S.E.  $\frac{1}{2}$  S.; Maplin lighthouse, N. by E.  $\frac{1}{3}$  E., distant  $3\frac{3}{10}$  miles.

BUOYS ON THE PORT HAND IN PROCEEDING THROUGH THE DUKE  
OF EDINBURGH CHANNEL FROM THE SEA TOWARDS THE RIVER  
THAMES.

**East Shingles**, a *spherical* buoy with *black and white horizontal stripes* and *staff and diamond*, lies in 7 fathoms, with South Shingles and Pan-sand beacons in line W. by S.; North Shingles beacon N.W.  $\frac{1}{4}$  W.

**Shingles Patch**.—No. 1 buoy is *can*, painted *black and white*, in *vertical stripes*, and surmounted by a *staff and cage*. It lies in 30 feet at low water spring tides, with South Shingles beacon S.W. by W., distant  $2\frac{5}{10}$  miles; West Mid Long-sand buoy N. by W.  $\frac{3}{4}$  W.

**Shingles Patch**.—No. 2 buoy is *can*, painted *black and white*, *chequered*, in 30 feet at low water spring tides, with South Shingles beacon S.W.  $\frac{1}{4}$  S., distant  $2\frac{5}{10}$  miles; North Shingles beacon W.N.W.

**Shingles Patch**.—No. 3 buoy is *can*, painted *black and white*, in *vertical stripes*, in 35 feet at low water spring tides, with South Shingles beacon S.S.W.  $\frac{1}{2}$  W., distant  $2\frac{6}{10}$  miles; North Shingles beacon W. by N.

**North-East Shingles** is a *black and white chequered can* buoy, in  $7\frac{1}{4}$  fathoms, with Monkton and South Shingles beacons in line, S. by W.  $\frac{1}{4}$  W.; North Shingles beacon, W. by S.  $\frac{1}{4}$  S., half a mile.

**North Shingles** is a *black and white vertically striped can* buoy in  $7\frac{1}{4}$  fathoms, with Sarre mill just open west of St. Nicholas wood, S. by W.  $\frac{1}{2}$  W., North-east Shingles beacon S.E.  $\frac{3}{4}$  E., 6 cables.

**Middle Shingles** is a *black and white chequered can* buoy in  $6\frac{3}{4}$  fathoms, with Girdler new beacon S.W. by S.,  $2\frac{4}{10}$  miles, North Shingles beacon E.  $\frac{1}{2}$  S.,  $1\frac{8}{10}$  miles.

**West Middle Shingles** is a *black and white vertically striped can* buoy in 8 fathoms, with Girdler new beacon S.  $\frac{3}{4}$  W.,  $1\frac{8}{10}$  miles, the North-west Shingles buoy W. by S.  $\frac{1}{2}$  S.,  $1\frac{4}{10}$  miles.

**OAZE DEEP BUOYS**.—**Shivering Sand** is a *bell* buoy, *striped vertically black and white*, with *beacon cage*, in  $5\frac{1}{4}$  fathoms; with Whitstable high mill, midway between Coke Oven chimneys, S.S.W.  $\frac{3}{4}$  W.; and Girdler light-vessel, S. by E.  $\frac{1}{4}$  E.,  $1\frac{3}{10}$  miles.

**East Red Sand** is a *can buoy, striped vertically black and white*, at the east end of Red sand, in 22 feet, with the westernmost low building at Reculvers; its length open west of Sarre mill, S. by E.  $\frac{1}{2}$  E.; Leysdown coast-guard station in line with Middle ground beacon S.W. by W.  $\frac{1}{4}$  W.

The three following buoys are upon the margin of the southern flats upon which their several shoals are based.

**Red Sand** is a *chequered black and white can buoy* in  $3\frac{1}{2}$  fathoms, to the northward of the dry portion of Red sand; with Margate mills, their apparent width open to the southward of Margate new church, bearing S.E.  $\frac{1}{2}$  E.; and Whitstable low mill, showing between the coke chimneys, S. by W.  $\frac{1}{2}$  W.

**East Spile** is a *black and white vertically striped can buoy* in  $3\frac{1}{2}$  fathoms, to the north-eastward of the east end of the Spile; with Southchurch spire, open of the east end of Shoebury coast-guard station, bearing N.W.  $\frac{1}{2}$  W.; and a conspicuous clump of trees in the background, in line with Leysdown church, S.W.  $\frac{1}{4}$  S.

**Cant Buoy**, *chequered black and white*, has been described on page 320.

**East Oaze** is a *black and white horizontally striped buoy, lighted by gas*, which shows an *occulting light* in 25 feet on the eastern extremity of the Oaze; with Herne high mill appearing just to the eastward of the clock-tower at Herne bay, S.  $\frac{1}{4}$  E.; Mouse light-vessel, N.W.Nly. 2 miles.

**Middle Oaze** is a *black conical buoy* in 21 feet, close to the south side of a patch of 6 feet. From the buoy, the west side of Cleve wood appears in line with the middle of Lower Hale grove, bearing S.E. by S.; a clump of trees on the back land, just to the right of Sheerness dockyard chapel, W.  $\frac{1}{2}$  S.

**West Oaze**, a *spherical buoy, striped horizontally black and white, with staff and triangle*, has been described on page 319.

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## CHAPTER X.

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 THE NORE TO LONDON BRIDGE.
 

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Variation,  $17^{\circ} 0'$  to  $16^{\circ} 45'$  West in 1889.

Decreasing about  $8'$  annually.

The **THAMES**, the most important, though not the largest river in Great Britain, rises from three sources, which unite near Lechlade, where the counties of Gloucester, Wilts, Berks, and Oxford border on each other, and where it becomes navigable for barges. Thence winding its course between low and fertile banks, and receiving several tributaries, it takes a general E. by S. direction for about 180 geographical miles to its estuary at the Nore, where it unites with the waters of the Medway, 41 miles below London Bridge. Its breadth at London bridge is 290 yards; at Woolwich, 490; at Gravesend, 850; and 3 miles below, 1,290 yards.

The river with its affluents, drains an area of upwards of 6,000 square statute miles; its height at Thames-head bridge is 376 feet above the sea level, at Lechlade 243 feet, showing an average fall in this part of its course of 6 feet to a mile; below Lechlade the average fall is no more than 2 feet 3 inches; and between London bridge and the Nore the fall is nominal.

The Thames from London to the Nore is in many places retained within its present limits by embankments. The surface of the river at high water is several feet higher than the surrounding country, so that it is in effect, in many parts, an aqueduct raised between artificial banks.

The tide flows up the Thames from the Nore for a distance of 58 nautical miles, till it is stopped by a weir at Teddington beyond Richmond, 20 miles above London bridge; but for this weir high water of a spring tide would reach  $1\frac{1}{2}$  miles beyond. Before the removal of old London bridge in 1833 the sectional area of the river below Trinity high water level, as stated by Mr. George Rennie, was 8,700 superficial feet, after the removal 17,600 feet. The greatest

fall through the arches of the old bridge was 3 feet 6 inches ; in the year 1834 it was reduced to 5 inches.

The Thames is navigable at high water for the largest ships as far as Deptford and for vessels of 27 feet draught up to London bridge.

The different bends of the river are called reaches, of which there are eighteen between the Nore and London bridge, and they will be described in ascending in consecutive order.

The tidal range of the river Thames has of late years gradually increased, due to the removal of shoal beds and improvements on the banks ; the tidal wave having thus freer scope.

**The Regulation of the River** is, by Act of Parliament, under a permanent body of 23 Conservators, whose jurisdiction extends from Cricklade in Wiltshire about 151 miles above London bridge, to a line drawn from the entrance of Yantlet creek to about a mile eastward of Leigh on the Essex shore of the river ; each extremity of this limit being marked by a square stone. The limits of the port of London are included between a line extending from the distance of 4 miles from the North Foreland lighthouse to a distance of 3 miles from the Naze tower on the coast of Essex on the east ; and London bridge on the west.

### **SPECIAL RULES FOR NAVIGATING THE THAMES.**

—Every vessel navigating the river is to proceed at such a speed, and in such a manner, as not to endanger the safety of other vessels, or moorings, or cause damage thereto, or to the river banks. Special care is to be taken when passing dredging vessels, or vessels engaged in removing obstructions.

All vessels belonging to the Thames Conservancy have the letters T.C. on them, or on a red flag displayed on board.

Every steam vessel is to be provided with an efficient steam whistle.

Steam vessels proceeding against the tide shall, before rounding any point in the river, ease their engines and wait until vessels rounding the point with the tide have passed.

Steam vessels crossing the river shall keep out of the way of vessels proceeding up or down the river.

Vessels are to keep the starboard shore on board, and to pass each other port side to port side when proceeding in opposite directions.

Vessels navigating against the stream are to give way to vessels navigating with the stream.

**Steam Whistle Signals.**—When two steam vessels are approaching with risk of collision, the following signals shall be intimations of the course they intend to take :—

(a). One short blast of the steam whistle of about three seconds duration shall mean : “ I am directing my course to starboard, and intend to pass you port side to port side.” The use of this signal is optional.

(b). Two short blasts of the steam whistle shall signify : “ I am directing my course to port, and intend to pass you starboard side to starboard side.” It is compulsory to use this signal when from any cause vessels cannot pass each other port side to port side.

(c). Three short blasts shall mean : “ I am reversing my engines.”

When a steam vessel is turning round, or for any reason is not under command and cannot get out of the way of an approaching vessel ; or when it is unsafe or impracticable for a steam vessel to get out of the way of a sailing vessel, she shall signify the same by four or more blasts of the steam whistle in quick succession.

Vessels coming out of dock to signify the same by a prolonged blast of at least 5 seconds duration.

These steam whistle signals are not to be used on any other occasions, and no other signal by whistle is allowed unless it be a prolonged blast of not less than 5 seconds duration.

These rules do not in any way supersede the ordinary rules for vessels in preventing collisions, or in carrying the prescribed lights, &c.

**TIDES.**—It is high-water, at full and change, at the Nore at 0h. 30m. ; at Gravesend, 1h. 5m. ; at Erith, 1h. 18m. ; at Woolwich, 1h. 37m. ; at London docks, 1h. 53m. ; at London bridge, 1h. 58m. The mean rise of the tide at springs at the Nore is  $15\frac{1}{2}$  feet ; at Gravesend,  $18\frac{1}{2}$  feet ; at Woolwich,  $18\frac{1}{2}$  feet ; at London docks,  $20\frac{1}{4}$  feet.

It is low-water at the Nore light-vessel 7h. 30m. ; at Gravesend, 6h. 58m. ; Erith, 6h. 18m. ; and at Woolwich, 5h. 40m. before it is high water at London bridge.

**Uniform System of Buoyage.**—The buoyage in the channels from the Nore up the river Thames, is in conformity with the Uniform System of Buoyage, 1883. For particulars of the London Trinity House system, see pages 12 and 13.

**DOCKS.**—The various docks in the Thames will be found described at pages 372, 384, *et seq.*

**SEA REACH** extends from the Nore to Lower Hope point, on the Kentish shore, and takes a general W.N.W. direction for about 13 miles ; on both sides of the river are extensive marshes, fronted by shoal flats to a considerable distance, with a deep water channel between them. The distance between the isle of Grain on the southern or Kentish side of Sea reach, and Shoeburyness on the Essex side, is  $4\frac{1}{2}$  miles across, but this distance is contracted by the shoals to a breadth of  $1\frac{1}{2}$  miles, and in the western part of the reach the channel is narrowed to half a mile in breadth.\*

**The isle of Grain**, at the confluence of the Thames and Medway, low, flat, and protected from inundation by strong embankments. Its shores are muddy, affording no landing except at high-water. It is about  $2\frac{1}{2}$  miles in length north and south, 2 miles in extreme breadth east and west ; and is formed on the west by Yantlet creek, which takes a winding course between the two rivers. On the eastern side of the entrance to Yantlet creek is the London stone, marking the limit as before mentioned, to which the jurisdiction of the Conservators over the river Thames extends. Slough fort, erected on the slope of the hill within Grain isle, is a conspicuous object. To the westward of Slough fort there is higher land, but there are not many conspicuous objects, the most notable objects being Hoo church tower, Cliffe church, and two high chimneys west of Cliffe.

**NORE SAND and YANTLET FLATS.**—Of the shoals bordering the whole of the southern shore of Sea reach, the easternmost is the Nore sand, a narrow ridge, dry at low-water, having its eastern dry extremity at about 2 miles from the nearest part of Grain islet, and about  $2\frac{1}{4}$  miles from the Cheney rocks house in Sheppey. From this it extends in the same direction for another mile, the depth gradually increasing to 18 feet. At rather more than half a mile east of the 18 feet limit is the Nore light-vessel. The northern edge of the sand takes a W.N.W. direction, is steep, and has a *black and white vertically striped* can buoy on it, in 24 feet, bearing N.W. by W.  $\frac{3}{4}$  W., 2 miles from the light-vessel.

Between the western part of the Nore sand and the shoal extending eastward from Grain islet, is a swatchway, of from 8 to 10 feet at

\* See Admiralty charts :—North Foreland to the Nore, No. 1,607, scale,  $m = 1\cdot4$  inches ; and Sheet 3, Sea reach, No. 1,185, scale,  $m = 2\cdot7$  inches.



low-water, used by small vessels and barges bound to and from the Thames and Medway. To facilitate its navigation a *black* and *white chequered can* buoy, called the Jenkin, is moored at the outer edge of the sand N.W. by W.  $\frac{3}{4}$  W.,  $1\frac{1}{4}$  miles from the Nore buoy. In using the swatchway vessels must keep to the south-westward of the Jenkin buoy.

To the westward of Jenkin buoy, and in continuation of the Nore sand, are the Yantlet flats, fronting the creek of that name at a distance of three-quarters of a mile. The north edge of the Yantlet flats is marked by a *black* and *white vertically striped can* buoy, in 18 feet, N.W. by W.  $\frac{3}{4}$  W.,  $1\frac{1}{4}$  miles from Jenkin buoy.

**BLYTH SAND.**—This dangerous bank, in places occupying half the breadth of the river, extends from the low marshy southern shore of Sea reach, between Yantlet flats and Lower Hope point, to a distance of nearly a mile, except at its western end, which gradually draws towards the latter point. A great portion of it is uncovered at low-water. The edge of the bank curves to the northward, and is marked by three *can black* and *white* buoys.\*

**SHOEBURYNESSE** forms the low north point of the entrance to the river Thames; from here the Essex shore trends about N.W. by W., and at the distance of a mile rises to a red clay cliff of moderate height, named Thorpe cliff; this continues for about half a mile, when it again becomes low for  $1\frac{1}{4}$  miles to the town of Southend. The tide ebbs off a considerable distance, but boats and flat-bottomed barges may land at high water on a fine beach extending along the shore at high-water mark.

At Shoeburyness are extensive Government works for exercising and testing great guns; and a dépôt of artillery has been established, with barracks and officers' quarters. By Act 25 and 26 Vict. c. 36, of the 17th July, 1862, vessels are forbidden to anchor or ground on that part of the Maplin sands eastward of Shoeburyness, which is now used and buoyed off for the artillery ranges, unless from stress of weather, under a penalty of forty shillings and not exceeding five pounds for every offence. The ordinary ranges of the guns are between 200 and 1,200 yards, but the extreme range may occasionally be nearly 5 miles.

**SOUTHEND** is a watering place, consisting of modern residences, presenting a handsome appearance from the river. A portion of the

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\* For position of buoys, see pp. 363 and 364.

town is built upon elevated ground faced with cliffs, from the eastern extremity of which a pier constructed on piles projects upwards of a mile in a southerly direction, over hard sand, to a depth of 10 feet at low water. The Congregational church spire is the most conspicuous object seen from the river. Southend is connected with London by railway.

The Southend flat, nearly the whole of which dries at low water, is a continuation of the western part of the Maplin, following the direction of the shore, from which it extends from one to  $1\frac{1}{4}$  miles, and is steep-to. The eastern portion is somewhat irregular. To the westward of Southend the flat unites with the shoals off Leigh creek.

**Lloyd's Signal Station.**—A station is established at Southend pier-head.

**LIGHT.**—A *fixed red* light is shown all night from the extremity of Southend pier, and a *fixed green* light near Vandervords pier for the guidance of boatmen.

**Life-Boats.**—Two life boats are stationed at Southend.

**Buoys.**—The south-eastern edge of Shoeburyness flat or Maplin sand is marked by four *conical black* buoys, and about  $1\frac{1}{2}$  cables from Southend pier-head is a *black and white vertically striped can* buoy, marking the edge of Leigh spit.\*

**The LEIGH MIDDLE** is a sandy bank about 3 miles in length and three-quarters of a mile in breadth, the shoalest water over which at low water, spring tides, is 11 feet. Its eastern extremity, in 24 feet, lies S.  $\frac{3}{4}$  E. a mile from Southend pier-head, and from thence it extends N.W. by W.  $\frac{3}{4}$  W., to the depth of 24 feet on its western end. The southern edge of the shoal, 2 miles from the Essex shore, runs nearly parallel to it, and is marked by two *black conical* and one *black and white spherical* buoys, the latter, surmounted with *staff and diamond*, being on the east extreme of the shoal.\* Between the northern part of this bank and the edge of the Southend flat there is a deep-water channel from a half to a quarter of a mile wide, narrowing to the north-west between the Leigh Middle and the Chapman sand, to about  $1\frac{1}{4}$  cables, which is called the Leigh channel.

#### BUOYS IN RIVER THAMES.

**Nore** is a *black and white vertically striped can* buoy, in 24 feet water, on the north edge of the Nore sand at  $1\frac{1}{2}$  miles from the

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\* For positions of buoys, see pp. 319 and 364.

eastern extremity, with Hamlet mill, on the Essex shore, a little open eastward of the terrace at Southend, bearing N. by W.; and the Nore light-vessel S.E. by E.  $\frac{3}{4}$  E., 2 miles.

**Jenkin** is a *black and white chequered can* buoy on the outer edge of the sands on the south side of the ship channel, and in the east side of the Fairway into the Swatchway; from it Queenborough pier appears just open of Grain islet S.  $\frac{1}{2}$  W. East River Middle buoy bears N.E.  $\frac{3}{4}$  E., distant nearly  $1\frac{1}{4}$  miles.

**Yantlet** is a *black and white vertically striped can* buoy, in 18 feet, about half a mile eastward of the spit of the same name, with the Chapman lighthouse bearing N.W.  $\frac{1}{4}$  N., distant  $2\frac{1}{4}$  miles; and St. Mary's church, Hoo, W. by S.  $\frac{1}{2}$  S.

**East Blyth** is a *black and white chequered can* buoy, in 30 feet of water, with Chapman lighthouse bearing N.E.  $\frac{7}{8}$  E., distant  $7\frac{3}{4}$  cables; and Mucking lighthouse N.W. by W.  $\frac{1}{8}$  W.

**Middle Blyth** is a *black and white vertically striped can* buoy, in 29 feet, lying opposite Hole haven, with Hole haven coast guard house N.E.  $\frac{3}{8}$  N.; and Mucking lighthouse W.N.W.  $2\frac{1}{2}$  miles.

**West Blyth** is a *black and white chequered can* buoy, in 21 feet, with Mucking lighthouse bearing N.  $\frac{1}{2}$  W., distant 6 cables; and the Middle Blyth buoy E. by S., distant  $2\frac{4}{10}$  miles.

**East River Middle** is a *spherical buoy striped black and white horizontally*, with a *staff and diamond*, in 24 feet at low water, with Prittlewell church one-third its length on the east end of Southend terrace bearing N.  $\frac{1}{8}$  W. Stony point beacon open north of Chapman lighthouse, W.N.W.

**River Middle** is a *black conical* buoy, in 21 feet water, with East River Middle buoy S.E. by E.  $\frac{3}{4}$  E.,  $1\frac{1}{2}$  miles. Extremity of Southend pier E. by N.  $\frac{1}{8}$  N.,  $1\frac{3}{10}$  miles.

**West River Middle** is a *black conical* buoy, in 19 feet, with St. Andrew's church, Shoeburyness, in line with extremity of Southend pier, East; Dockyard sheers, Sheerness, on with N.E. point Grain island S. by E.  $\frac{3}{4}$  E.

**YANTLET MIDDLE GROUND.**—In the fairway channel between the Leigh Middle and the Yantlet flats, are detached narrow patches extending in the direction of the channel for  $1\frac{1}{2}$  miles having 17 and 18 feet over them at low water. They are subject to change. From the east end of these patches the West River Middle

buoy bears N.N.W.  $\frac{1}{4}$  W., distant  $1\frac{1}{4}$  miles ; and the Jenkin buoy S.E.  $\frac{1}{4}$  S., three-quarters of a mile. From the west end the Chapman lighthouse bears N.W.  $\frac{1}{4}$  N., distant 2 miles ; and Yantlet buoy S.E. by E., 3 cables. The channel between these patches and Leigh Middle is three-quarters of a mile wide, and between them and Yantlet flats rather more than a cable.

**LEIGH.**—At  $2\frac{1}{4}$  miles westward of Southend is the small town of Leigh ; the coast between consisting chiefly of low cliffs. On the shore at a mile eastward of Leigh is the Crow stone, or London stone, which marks the north shore eastern termination of the conservatorial jurisdiction of the river. Leigh stands on the acclivity of a hill, and its ancient church with square tower is conspicuous. The town is chiefly inhabited by fishermen, and has upwards of 150 boats employed in shrimp and oyster trade. Here are likewise nurseries or parks for breeding oysters, for which the shore seems well adapted. Behind and to the north-west of it the land is elevated, and at  $1\frac{1}{3}$  miles in the latter direction is the village of Hadleigh, to the southward of which are the ruins of Hadleigh castle, picturesquely situated on the spur of a hill. Nearly the whole of the space between the Leigh Middle and the shore of Leigh is a shoal, and to the westward is low marsh land through which the waters of the Thames find their way at flood tide.

**Canvey island** consists of about 3,500 acres of marsh land embanked all round ; its eastern end is nearly a mile distant from Leigh. The approaches to Leigh and the creeks inside Canvey island are through narrow shallow channels, called the Slade and Ray gut, having a common entrance marked on its western side by the Leigh spit buoy before mentioned (page 363). From Canvey point the low south shore of Canvey island takes a westerly direction for  $2\frac{1}{2}$  miles to the west end of Shell bank, where it forms (Thorney creek) a small bight, on the western side of which, at Stony point, is a beacon. Nearly half a mile westward of the beacon is Scar house and point ; and three-quarters of a mile to the W.N.W. of the point is Hole or Holy haven, a narrow inlet with depths of 7 to 11 feet, in the entrance to a muddy creek forming the western side of Canvey island. Supplies of lobsters from Norway and Scotland are deposited here for conveyance up the river.

**CHAPMAN SAND**, the greater part of which is dry at low-water, borders the shore of Canvey island. From Canvey point the

sand extends to the eastward for  $2\frac{1}{2}$  miles, covering the inner sands fronting the town of Leigh, and forming the western boundary of the entrance to the Slade and Ray gut. This part of it is named Marsh End sand. The southern edge of the Chapman sand forms the northern boundary of the Leigh channel. To the westward the edge of the Chapman sand draws towards the shore. The Scar elbow, the southern edge of the shallow water off Stony point beacon, extends out about a cable from the shore, and between this and Hole haven only a little more than a cable, and is steep-to. At Thorney creek the nature of the ground, which uncovers at low-water, changes from a sandy mud to mud.

**LIGHT.**—A lighthouse, 74 feet high, supported by screw piles and painted red, stands upon Chapman head, or within the edge of a bend in the sand, between Canvey and Stony points. The light is a double occulting light every half minute, that is suddenly disappearing for *three seconds*; it as suddenly reappears for *three seconds*; again suddenly disappears for *three seconds*, and then reappears at full power for the remainder of the half minute. When to the northward of a N.W. by W.  $\frac{3}{4}$  W. bearing it shows *white*; west of that bearing which leads south of the Leigh Middle buoys, it shows *red*. The light is placed at an elevation of 40 feet above high water, and in clear weather should be seen from a distance of 11 miles. A bell is sounded three times in quick succession every 15 seconds during thick or foggy weather.

**Beacon.**—On the marsh inland of Stony point, a quarter of a mile eastward of the Scar houses, is a beacon, 58 feet high, with a diamond-shaped head surmounted by a ball. The Chapman lighthouse twice its length South of Shell bank and open North of Stony point beacon, N.W. by W.  $\frac{3}{4}$  W., is the leading mark along southward of the Leigh Middle.

**Hole Haven**, separating Canvey island on the west side from the main land of Essex, is the station appointed for the shipment and discharge of dynamite or other very dangerous explosives. Vessels having to ship or discharge a larger quantity than five tons have to anchor within a mile of the creek in which the floating magazines lie.

**Shell Haven.**—The Essex shore from Hole haven to Mucking lighthouse,  $2\frac{1}{4}$  miles westward, is bordered by a narrow mud bank, steep-to. At  $1\frac{1}{4}$  miles from the former is an inlet, dry at low water, called Shell haven, having a house with some trees about it

on the eastern bank; half a mile further west is a pier and storehouse, connected by a railway with the London, Tilbury and Southend line, named Thames haven station. Rather more than half a mile west of Thames haven pier is another pier and large storehouse for petroleum.

**MUCKING LIGHTHOUSE** stands on the north shore of the river, about a mile westward of Thames haven pier, or 5 miles from the Chapman lighthouse. It is built on piles at the edge of the eastern part of Mucking flat, 200 yards from the keepers' houses, to which it is connected by a pileway, and painted *red with a white* band under the lantern. The light is *occulting every half minute*, at an elevation of 40 feet above high water, and should be seen in clear weather from a distance of 11 miles. The light is *white with red* sectors as follows: bearing W. by N.  $\frac{1}{2}$  N. it clears Scar elbow. To the northward of this line it shows *red*, but to the southward of it *white*. On the bearing of N.  $\frac{1}{4}$  W. a narrow strip of *red* marks West Blyth buoy. On the bearing of N.E.  $\frac{1}{4}$  E., and all to the westward of it over Ovens spit in 9 feet at low water it is *red*. A bell is sounded once every 10 seconds during thick or foggy weather.

**TIDAL STREAM.**—At the Nore light-vessel, although it is high water by the ground a few minutes earlier than at Sheerness dockyard, yet the stream runs up the Thames for half an hour after high water at the yard, by which time the water, perhaps, has fallen a foot, and in the same manner it rises a foot before the flood appears to run. The greatest velocity of the tides at springs is 3 miles an hour, and at neaps 2 miles. The flood sets to the westward fairly through Sea reach, and is most rapid in the narrowest part, between the Blyth and Chapman sands. There is a slack along the northern edge of the Blyth sand on the ebb, in which vessels bound up the river may navigate, keeping outside the Blyth buoys and using the lead. The direction of strong winds considerably affects both the times and the heights of high water, and the varying pressure of the atmosphere partially affects its height.

**DIRECTIONS.**—From a quarter of a mile northward of the Nore light-vessel the direct course to the fairway in Sea reach between the Leigh Middle and the Yantlet flat is N.W. by W.; but as this course would probably lead over 19 feet at low water, vessels of large draught should steer N.W.  $\frac{1}{2}$  W. for the River Middle east

buoy; when Chapman lighthouse open northward of Stony point beacon, bearing about N.W. by W.  $\frac{3}{4}$  W., will lead in the deepest water, about 23 feet at low-water springs; between the 19 feet patches and the Leigh Middle ground.

Having passed the West River Middle buoy, a W. by N.  $\frac{1}{2}$  N. course for about  $5\frac{1}{2}$  miles leads southward of the Chapman sand and Scar elbow to abreast Shell haven, when a mid-channel course about W.  $\frac{1}{2}$  N. may be taken for the bend of the river between Mucking lighthouse and West Blyth buoy, and care must be taken not to bring Mucking lighthouse westward of W. by N.  $\frac{3}{4}$  N.

The lower staging or landing of Chapman lighthouse is 6 feet above low-water springs; it is a good gauge for heavy laden vessels, as there will be always at least 28 feet water through the reach when this stage is awash.

Or from the same position northward of the Nore light-vessel, a N.W. by W.  $\frac{1}{2}$  W. course will carry a vessel along the southern side of the reach, passing the Nore and Jenkins buoys on the port hand, and between Leigh Middle and Yantlet Middle to the northward of the Yantlet flats.

Vessels passing about half a cable southward of East River Middle buoy, and a good cable southward of River Middle and West River Middle buoys, will carry the deepest water.

When at a distance of rather more than half a mile northward of the Yantlet *black and white can* buoy, a course about W. by N.  $\frac{3}{4}$  N. will lead northward of the East Blyth *can* buoy, and nearly up to the bend of the river between Mucking lighthouse and West Blyth *can* buoy, then edge to the southward in the centre of the river into Lower Hope reach.

**AT NIGHT.**—From a quarter of a mile northward of the Nore light-vessel steer N.W.  $\frac{3}{4}$  W. until the Chapman light bears N.W. by W.  $\frac{3}{4}$  W., then steer this latter course, keeping just on the line of the Chapman *white and red* lights until Southend pier light bears N.E. by N. to avoid the 19 feet patches, then keep the white light in sight, and pass about  $3\frac{1}{2}$  or 4 cables southward of the light. Then steer about W. by N.  $\frac{1}{2}$  N. towards Mucking light, keeping the *white* light also in sight to avoid the Scar elbow. When at the distance of half a mile from Mucking light steer about W. by S., and a vessel will pass the narrow stripe of *red* light that shows in the direction of the West Blyth buoy into Lower Hope reach.

**LOWER HOPE REACH** extends in a south-west direction from Sea reach, between a line drawn from Mucking lighthouse on the northern shore, to the west end of Blyth sand on the southern, and a line from Coalhouse point to the beacons opposite on Higham Marsh, where the river bends to the westward, between Tilbury fort and Gravesend. The land on either side is marshy, and from Mucking lighthouse a mud flat borders the whole of the western shore for about one-third the distance across the river ; whilst within a mile of the lighthouse, patches, with 17 and 18 feet water over them, extend from the Mucking flat nearly half-way across the river. On the shore to the northward are the churches of Pitsey, Fobbing, and Corringham ; and to the westward those of Stanford-le-Hope, Mucking, and East Tilbury.

Pitsey church, which stands farthest to the north-east, and is in the middle of a round clump of trees, has a shingled spire, and is an excellent mark ; Fobbing church tower is also conspicuous ; Corringham has a low spire ; Stanford-le-Hope has a tower on its north side ; and East Tilbury, standing near the upper part of the reach at Hope point and Coalhouse fort, has a white spire on a tower steeple, which is easily recognised. On the eastern side of the river is the conspicuous church of Cliffe, with a chalk-pit to the westward of it, a brick chimney 185 feet high, an iron chimney 156 feet high, and the beacons marking the measured mile between Lower Hope point and Cliffe creek.

At Lower Hope point is the boundary stone of the jurisdiction of the Company of London Lightermen and Watermen.

At the junction of Lower Hope and Gravesend reaches three powerful batteries are constructed, viz., Coalhouse fort near East Tilbury, and Cliffe creek and Shorne Mead batteries at the shore edge of Higham marsh. On the West side of Lower Hope reach about a mile below Coalhouse point a powder hulk is moored.

**Gas buoy.**—A large *black conical* buoy in 18 feet marks the eastern part of the Ovens mud flat, extending from Coalhouse point. The buoy is lighted by gas and exhibits an *occulting* light ; it lies with East Tilbury church spire on with the south-west extreme of Coalhouse fort, N.N.W. ; and the chimney of the pumping engine at Tilbury docks in line with a hut on Coalhouse point, W. by N.  $\frac{3}{4}$  N.

**Measured Mile.**—For the purpose of ascertaining the speed of steam vessels, the length of a nautical mile is marked on the eastern



shore of Hope reach. The north-east marks are two beacons in a line erected on Lower Hope point ; and the south-west marks are two beacons in line, at the north-east point of Cliffe creek, near the coastguard station.

**Bar.**—In Lower Hope reach just north of Cliffe creek there is a mud flat or bar extending across the river of 23 to 24 feet at low water ordinary springs.

**DIRECTIONS.**—A vessel from Sea reach having arrived at a convenient distance abreast the West Blyth buoy, should steer about W. by S., which will carry her to the fairway in Lower Hope reach. Gravesend old mill, in line with East Tilbury church spire, W.S.W., leads along the edge of the shoal from the West Blyth buoy to Lower Hope point. When Mucking lighthouse bears about N.E., keep it in that direction, and steer S.W., which will lead to abreast the *black* gas buoy on Ovens flat ; or pass in mid-channel down the reach, rather towards the eastern shore. Gravesend old mill, in line with Milton church and the north house of the Hospital, W.  $\frac{3}{4}$  S., or iron chimney in line with Cliffe creek battery flagstaff, E. by N.  $\frac{1}{2}$  N., clear the Ovens flat. On the eastern shore of Lower Hope reach the flood tide is slack : and close to the shore no tide sets at all. On the western shore opposite Lower Hope point the ebb tide is slack, but to the eastward of Mucking lighthouse it sets strong to the eastward towards Shell haven.\*

**AT NIGHT.**—Having arrived at the narrow stripe of *red* light, that is shown from the Mucking lighthouse in the direction of the West Blyth buoy, at a distance of 3 or 4 cables from the light, a W. by S. course will carry a vessel to the fairway in Lower Hope reach. When Mucking light shows *red*, steer about S.W., taking care to keep to the southward, so as to open the white light in approaching Coalhouse point to avoid the Ovens flat extending from that point.

**GRAVESEND REACH** is  $3\frac{1}{2}$  miles in length in an E.S.E. and W.N.W. direction, and between the town and Tilbury fort on the north shore, the navigable part of the river is about  $3\frac{1}{2}$  cables in breadth ; it is bounded on the Essex or north side, between Coalhouse point and Tilbury ness, by the Tilbury and Chadwell marshes ; and on the Kentish or south side by the Higham marshes, Gravesend, and the shore of Northfleet. Here all vessels arriving from abroad are visited by the health officer, receive on board the revenue

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*See Admiralty plan of Gravesend reach, No. 2,151, scale,  $m = 5\cdot0$  inches ; and London to Gravesend, No. 2,484 scale,  $m = 4\cdot0$  inches.*

officers, and change pilots. Off Gravesend there are six sets of moorings, capable of holding the largest ships, with mooring buoys attached to them; they are mostly used by large ships and transports on their outward voyages. The time allowed by the Thames Conservancy for using these buoys being 3 days. The two eastern buoys are farther apart than the others to accommodate the large ships that occasionally stop here.

On the southern shore of Gravesend reach, between Gravesend and Shorne mead fort beacons have been erected marking the nautical miles.

Vessels anchoring at Gravesend should keep on the south side of the reach with the *red* light at Northfleet in sight; but if under way, on the north side in the navigable channel, with the *white* light visible.

**GRAVESEND**, on the right bank of the Thames, is built on the declivity of a hill sloping down to the river. It occupies a pleasant and healthy situation, and from the heights above the town, especially that called Windmill hill, extended views of the river with its windings and shipping are obtained. The easy access by steamers and railways to this place renders it the resort of a constant succession of visitors from London, to which it is chiefly indebted for its prosperity, and which has been the cause of its gradual increase in size and importance. There are two commodious piers; that belonging to the town is 160 feet long, consisting of piles of cast iron, supporting a floor, extending outwards nearly 50 feet beyond low-water mark, with a bell, clock, and lantern on shore, supported by ornamental columns. At  $1\frac{1}{2}$  cables eastward is the Royal terrace pier and gardens.

The Gravesend chalk and flint are extensively worked in the vicinity. Rope-making and ship-building are carried on to some extent, and numerous smacks and small craft belonging to the port are employed in the herring, shrimp, turbot, and cod fisheries; and a large part of the trade of the place arises from the intercourse with the numerous outward-bound vessels which stop here; there is every facility for the supply of coals to shipping from floating depôts

Gravesend is  $23\frac{1}{2}$  miles from London bridge by the North Kent railway. There is a steam ferry to the opposite shore, which connects Gravesend to the London, Tilbury, and Southend railway. The gardens around Gravesend are rich and fertile; they not only supply the numerous shipping which stop here with all kinds of vegetables, but furnish some to the London market. An excellent

supply of meat, poultry, &c., is to be found. The population of Gravesend in 1881 was 31,838.

**Supplies.**—All supplies are readily obtained at Gravesend. Coal is kept on board hulks moored in the river just east of the town, and vessels are coaled along-side with great facility. Water is taken off in a floating tank containing about 30 tons.

**CAUTION.**—Ships with explosives on board are not allowed to lie above or to the westward of a notice board on the south or Kent side of Gravesend reach, about a mile below the town. Ships taking in or discharging powder have to lie at one of the buoys specially appropriated for them off Shorne Mead battery. These buoys are painted *red*.

The harbour master's office at Gravesend is at the east end of the town, close to the Custom-house.

**Hospital.**—There is an excellent hospital for contagious diseases at Gravesend, and a good Sailors' Home.

**Tilbury Fort**, opposite Gravesend, forms one of the main defences for the entrance to the Thames. It has very large bastions, and on its ramparts are mounted batteries of heavy ordnance. It is encompassed by a deep wide fosse, and the garrison have the power to lay the whole of the surrounding level under water. The block house was first erected by King Henry VIII. in 1539. The width of the Thames here at high water is 850 yards.

**TILBURY DOCKS**, opposite Gravesend, consist of a tidal basin of  $17\frac{1}{2}$  acres, of a main dock of 23 acres, with three branches of 11,  $9\frac{1}{4}$ , and  $9\frac{1}{4}$  acres, or a total area of 70 acres. The depth of water in the tidal basin is 26 feet at low water; from this a lock of 700 feet in length and 80 feet broad leads to the main dock, the depth in the lock entrance being  $23\frac{1}{4}$  feet at low water. Between the tidal basin and main basin there are in addition two long docks which may be used as locks if required, or may be used as single docks, or divided to make four docks. The western of these two docks is 875 feet in length, and 70 feet wide, with a depth of 16 feet over the sill at low-water. The eastern is 875 feet long 60 feet wide, with a depth of 11 feet over the sill at low-water.

Round the sides of the main basin and tidal basin are convenient warehouses, connected by rail with London, whilst at the entrance is a fine hotel for the convenience of passengers embarking in the ships leaving the docks.

**LIGHTS.**—At Northfleet,  $1\frac{1}{2}$  miles above Gravesend, and abreast of Tilbury ness, an *occulting* light, which suddenly disappears for *three seconds every half minute* is exhibited from a skeleton beacon 53 feet high, erected upon the India Arms wharf, which, when bearing W. by N.  $\frac{3}{4}$  N., is in line with the western of three high chimneys of the cement works. From Gravesend reach the light shows *white* to the northward of this line, and *red* to the southward over the anchorage ground. Also, *white* through Northfleet Hope, southward and westward of a S. by E. bearing, which line passes over Broad ness flat in 15 feet at low water ; and *red* when bearing East of S. by E.

**NORTHFLEET HOPE** is the reach extending from the western part of Gravesend reach nearly north for  $1\frac{1}{2}$  miles to Broad ness, a low marshy point. The marshes on the west side of the reach are low, and sometimes overflowed by the tide to the distance of half a mile. Along both sides of the reach the shore is more or less bordered by mud flats, which at Broad ness stretch 1 cables to the north-eastward. On the Essex shore, in the bend of the river northward of Broad ness, a bank of mud and stones, dry at low water, named Black shelf, extends off nearly  $1\frac{1}{2}$  cables from the shore, The village of Northfleet with its church is on the Kentish shore at the southern part of the reach. At about half a mile to the north-west of it, on an eminence, is Huggins college, a charitable institution for 40 decayed tradesmen, consisting of a range of buildings with a lofty slender spire rising from its chapel. At Northfleet is a private ship-building yard belonging to Mr. Pitcher, with a graving dock 400 feet long, and having  $19\frac{1}{2}$  feet over the sill, excavated out of the chalk. Between Northfleet and Gravesend are the Rosherville gardens, with a small pier at which steamers call. In the gardens is a clock tower, the clock having a white face ; whilst close to is the spire of St. Mark's church. Three tall chimneys, from 180 to 200 feet high, at Northfleet, are also excellent marks.

Grays Thurrock is on the Essex shore at the northern part of the reach, having a church with a square tower and pyramidal top. To the westward of Grays Thurrock are several chimneys of cement works, the highest 160 feet ; whilst N.W. by W., nearly a mile from the church, are two very conspicuous chimneys, one rather lower than the other. On the shore to the south-westward is St. Clement's church, West Thurrock, with a low tower. Between Broad ness and

the Black shelf, vessels should keep in the tideway, and in turning up with the flood not stand into the eddy. The tide, both ebb and flood, sets strongly towards the Black shelf, and the ebb towards the shore at Northfleet. Vessels whilst in the fairway of Northfleet Hope will have the *white* light at Northfleet open. The *red* light should not be opened until to the northward of Broad ness.

**Training Ships.**—Off Grays is moored the *Exmouth* training ship for boys, to fit them for the Royal or Mercantile Marine, also the *Shaftesbury* for the London School Board.

**LIGHT.**—On Broad ness is an iron frame-work lighthouse, 44 feet high, from which at an elevation of 38 feet a *white flashing* light is exhibited, which gives a *flash* of *three seconds* duration *every ten seconds*.

**Beacons.**—On the Essex shore, about a cable south from St. Clement's church, are two *red* beacons, which in line, bearing W. by N.  $\frac{1}{4}$  N., clears the Black shelf in 30 feet water.

**ST. CLEMENT or FIDDLER REACH,** in an E.N.E. and W.S.W. direction, and about  $1\frac{1}{4}$  miles in extent, is that part of the river bounded between the village of West Thurrock and Stone ness on the north and Broad ness to Greenhithe on the south shore ; hence the Thames turns at a right angle to the north-westward into Long reach. The church of West Thurrock with a low square tower, dedicated to St. Clement, whence the reach takes its name has already been mentioned. The peculiar agitation of the water in the lower part of the reach caused by the contracted space in which the stream with its eddying tide runs during the flood, may have given rise to the second name. To the north-east is Belmont castle, a handsome castellated building on the rising land, but this is not very conspicuous ; on the south side E.S.E. of Greenhithe are the Portland Cement Works, with one chimney 250 feet high, besides several lower. The flats extend a little off each side of the reach, and the depth in the centre of the channel is only 19 feet ; the deepest water being on the Essex shore. Swanscombe marsh forms the east side of the reach, the northern part of which is low, and sometimes overflowed by the tide to the distance of half a mile.

**LIGHT.**—On Stone ness an iron framework lighthouse is erected 44 feet high, which exhibits at an elevation of 38 feet above high water a *white occulting* light which is eclipsed for *half a second* every *two seconds*.

**Moorings for adjusting compasses.**—On the south side of St. Clement's reach eastward of Greenhithe three mooring buoys have been placed with smaller buoys around for the convenience of vessels adjusting their compasses. In moderately clear weather Belvedere tower may be seen from these moorings, distant 5 miles. From the western buoy it bears N. 69 W. (true), from the central buoy, N. 70½ W. (true), and from the eastern buoy, N. 71¾ W. (true).

**Government mooring buoy.**—To the westward of the buoys for adjusting compasses is a Government mooring buoy for the convenience of the Royal yachts, &c.

**LONG REACH**, between Greenhithe and Crayford ness, extends 3 miles in a S.E. by S. and N.W. by N. direction, and at the narrowest part between the low water shores is 3 cables wide. It is bounded on the north-east by the West Thurrock marshes, and on the south-west by Stone and Dartford marshes.

**GREENHITHE** stands on the Kentish shore in the bend on the river at the south-east end of Long reach. It is a pretty village and has long been noted for its export of chalk and lime; in the former petrified shells and many other extraneous fossils have been found. Ingress abbey, partly built from the stone of old London bridge, and park is close to the eastward of it. To the south-east is seen the dark spire of Swanscombe church; and on the west is the village and church of Stone. The latter is a fine gothic structure, with a low square tower, surrounded by orchard trees; the chancel roof of the church is higher than the nave. Inside, the church is finely decorated. South-east of it is a high chimney which is very conspicuous both from Long and St. Clement's reaches. In the valley beyond is Stone castle.

At the upper end of Long reach, at about a quarter of a mile south-east from Crayford ness, just above the Long reach tavern, is Dartford creek, and on the opposite side of the river is the village of Purfleet. Here the Government have extensive bomb-proof magazines. On the rising land called Beacon hill is a flagstaff and a small circular building used by the Trinity Board for lighthouse experiments. From Dartford creek the water shoals off a considerable distance, and at 1¼ cables from the shore there are 16 feet.

Vessels steering up the reach should keep in mid-channel and rather towards the northern shore in approaching Purfleet, until the eastern part of Erith is open, then round Crayfordness at a distance of 1½ cables, and steer for the northern shore.

**Anchorage.**—Above Greenhithe, in the bay opposite the village of Stone, there is good anchorage for the largest vessels in 30 feet water ; and in any part of Long reach large vessels may anchor.

**Training ships.**—Off Greenhithe are moored the *Chichester* and the *Arethusa* Industrial school and Training ships for boys, and the *Worcester* for educating young officers. Off Purfleet, the *Cornwall* for educating boys from reformatories.

**Measured mile.**—On Dartford marshes the length of a nautical mile is measured for steam vessels to ascertain their speed by.

**Small-pox hospital.**—On the Dartford shore between the measured mile beacons three ships are moored close to each other to serve as a small-pox hospital. Opposite the north-western ship is a landing jetty and on the shore abreast Laundries, etc., and a road to a convalescent hospital inland.

**ERITH RANDES**, extending  $1\frac{1}{2}$  miles E. by S. and W. by N., is the reach in that part of the river between Purfleet and Erith, having Aveley and Wennington marshes on the north, and Crayford marsh on the south. In this reach the water begins to get shallow there being several banks of sand, gravel, and mud in it over which the depths vary from 13 to 18 feet.

**ERITH** is a prettily situated town in the bight of the river opposite Cold Harbour point. There are one or two conspicuous chimnies in the town, and at the back the Congregational church spire may be distinctly seen, whilst at the north end is the church of St. John, with a spire, west of which on rising ground is Belvedere tower and an Asylum for old seamen.

Close to the river bank, south-eastward of St. John's church, Erith, is a beacon with a white diamond top. This beacon kept in line with Belvedere tower bearing W. by N.  $\frac{3}{4}$  W. clears the shoal water off Cold Harbour point in not less than 15 feet. When Cold Harbour point bears N. by E. and the eastern shore of Erith reach is well open, steer to the northward in mid-channel or rather towards the western side of Erith reach.

**ERITH REACH** lies S. by W. and N. by E., and is about  $1\frac{1}{4}$  miles in length. On its eastern side are the Wennington and Rainham marshes, and on the western side the Erith marsh.

On the eastern side of the river, on Cold Harbour point, are some farm houses ; a bank extends off it for about  $1\frac{1}{4}$  cables, on which will be found 16 to 18 feet at low water. Rainham creek is formed on the east side in the upper part of the reach ; and at a mile north-east from its entrance is the village and church of Rainham ; the tower of the latter has a short white spire. Just southward of Rainham creek are some cement and manure works with a tall brick and iron chimney. On the opposite or west side of the river is Jennings tree point and magazine, off which a bank extends  $1\frac{1}{4}$  cables. Between Jennings tree point and Erith are some conspicuous notice boards and a few rather low chimneys. Vessels proceeding through Erith reach should keep mid-channel, giving Cold Harbour point a wide berth in entering.

**HALFWAY REACH** extends from Jennings tree point on the Kentish shore, in a north-west direction for about  $1\frac{1}{2}$  miles, to Leather Bottle point or Cross ness, and is bounded on the south by the Erith marsh, and on the north or Essex shore by Hornchurch and Dagenham marshes. Above Jennings tree point are two magazines, then occur some manure works, and afterwards the buildings in connection with the southern outfall of the London sewage, rendered conspicuous by a tall chimney surmounted with ornamental iron work. A little eastward of Leather Bottle point is a public-house known as the Leather Bottle, which is midway between London Bridge and Gravesend. On the north shore, at rather more than half a mile eastward of Leather Bottle point, is a place called O'd Breach, formed in the embankment of Dagenham marsh by a high tide in December 1707. Dagenham pool within was proposed as the site of a dock, and jetties were extended from the shore to form a coffer dam whilst the work was proceeding, but this enterprise has long since been given up, and the jetties are fast falling to decay. South-east of the Dagenham jetties are Crossfield's works with a low chimney. The depths in the upper part of Halfway reach are shallow. Between the Southern Outfall chimney and Jennings tree point a bank of less than 16 feet extends from the south-west shore nearly over to the Essex shore, whilst abreast the Leather Bottle public-house there is a bar of 16 to 17 feet at low water across the river.

On the south side of the reach opposite the outfall sewers of the main drainage of the Metropolis, the contents of which are let into the river every high water, are large banks of mud.



Vessels of large draught having rounded Jenningtree point in mid-channel should keep along the northern shore at a distance of about  $1\frac{1}{4}$  cables. The common anchorage in Halfway reach is on the north side, with Cold Harbour point just shut in with that of Jenningtree ; here there will be 20 and 23 feet at low water.

**BARKING or TRIPCOCK REACH**, East and West, with a small curve to the southward, is  $1\frac{1}{2}$  miles in extent, between Leather Bottle point and Margaret ness on the south shore. At the western part of the reach on the north side is Barking creek, with magazines and chemical works at the eastern side of the entrance, readily known by the tall chimneys.

Barking church has a square tower, and is about  $1\frac{3}{4}$  miles from the river. On the south side of the reach are the Plumstead marshes, and beyond them on the rising land the old red brick church of Plumstead. About a third of a mile from the house near Leather Bottle point are two red roofed houses, with a powder magazine and a jetty.

About an eighth of a mile westward of Barking creek is the northern outfall of the London main drainage.

Immediately north of Leather Bottle point is a deep hole of 30 feet one cable off shore, westward of which the river is again from 16 to 20 feet in depth at low water.

At about three cables eastward of Margaret ness are some trees, and a Government powder magazine with a jetty. A flat in front of it extends a little off having 12 feet on its edge a cable from the jetty. Barking or False point is about a third of a mile eastward of the entrance to Barking creek ; the shore from thence eastward curves a little to the northward, and is bordered by a mud flat, which, opposite Leather Bottle point, extends off about a cable.

About a cable off Barking or False point an irregular bank called the Moorlogs, stretches in the direction of the river for more than a cable with 8 to 10 feet water over it, leaving a narrow passage between it and the south shore having from 14 to 21 feet water. The south-east tangent of Dagenham jetty works on with the high-water mark of Leather Bottle point leads south of these banks in not less than 15 feet at low water.

At Beckton, opposite Margaret ness, is a large **T**-headed pier for the use of the colliers discharging coals for the large gas works situated here. Inside the pier are large buildings, numerous gasometers, and a tall clock tower, the clock having a white face.

**GALLION REACH**, between East Ham level on the west, and Plumstead marshes on the east, lies N.E. and S.W., and is about a mile in length. About half way along the northern side, a short distance south from Duval's house, are the two lock entrances to the Royal Albert Dock, connected to the Royal Victoria Dock. On the western part of the southern shore are the extensive works of the Woolwich arsenal. The western shore is bordered by a shelf, which at low water is uncovered some distance, and the 12 feet line of soundings runs along from  $1\frac{1}{4}$  cables to a cable from the shore; the deepest water being on the south-east side of the reach. A shelf also extends a little off from the east shore, between Margaret ness and Ware point. In the middle of the reach the depths are from 17 to 25 feet. On the eastern side above Margaret ness are eight sets of moorings, being No. 2 section, to accommodate coal vessels. A red buoy is moored in the reach for vessels discharging or taking in powder, and a Government powder hulk is moored head and stern immediately above Margaret ness.

**WOOLWICH REACH** lies E.S.E. and W.N.W. between Gallion point and Hook ness, a distance of 2 miles, with an average width of a quarter of a mile; the river then runs N. by W.  $\frac{1}{2}$  W. nearly a mile, when it trends round Lea ness or Blackwall point. The latter part is called Bugsby's reach. The river on the north side is here bounded by the Plaistow and East Ham levels; and the south by the town of Woolwich, the arsenal, the old dockyard, and Greenwich marsh. At nearly half a mile westward of Gallion point on the Essex shore, and nearly opposite the west end of the arsenal, is the terminus of the North Woolwich railway, with a low-water pier, and steam ferry across to Roff's pier; about 4 cables westward of it is Ham creek. The shore from Gallion point is bordered by a flat, which extends off from a quarter to nearly three-quarters of a cable to Ham creek.

From Ham creek to Hook ness the edge of the flat is nearly a cable from the shore, with 5 and 6 feet on it; and all along the north part of this reach the water is shallow to a distance of a quarter of a mile from the shore. Abreast the town of Woolwich the shore is bordered by a flat at a distance of about half a cable. At half a mile westward of what was the dockyard is Charlton ballast wharf, at one cable north-west of which is a patch with only 8 feet water on it. There are other patches with 10 feet on them between the Ballast wharf

and Hook ness. The deepest water in Woolwich reach, of from 12 to 18 feet, is along the southern shore until approaching Charlton ballast wharf.\* Just above Charlton pier the *Warspite* training ship is moored.

In Bugsby's reach the shore is bordered on either side by narrow flats. Hook shelf extends about a cable from Hook ness, with 8 feet on its edge. Off the Trinity wharf, at the entrance to Bow creek, in the upper part of the reach, there is a flat from the shore having 8 feet on its edge. On the south and west sides of Woolwich and Bugsby reaches, from Charlton pier to opposite the Victoria docks, are sets of moorings with buoys, being No. 1 collier section, at which coal vessels are made fast whilst waiting their turn to enter the pool to unload, or until their cargoes are sold.

The river Lea divides Middlesex from Essex, and falls into the Thames opposite Lea ness or Blackwall point. At the west side of the entrance, commonly called Bow creek, is the Buoy wharf of the Trinity House, where is an admirable establishment for the fitting and repairs of light-vessels and buoys belonging to the Corporation.

**Woolwich Town** extends for 2 miles along the south bank of the Thames, and gradually rises up the brow of the hill for half a mile to a spacious level of 250 acres, named Woolwich Common. Here, at a height of 150 feet above the river, are the head-quarters and barracks of the Royal Artillery. Just above, to the south-east, Shooter's hill attains a height of 446 feet. In the upper part of the town are barracks for 1,200 men, and an infirmary well placed on the slope of the hill, with beds for 270 patients.

Woolwich joins with Deptford and Greenwich under the name of the borough of Greenwich. The whole population in 1881 was 206,651.

**CAUTION.**—No steam-vessel is to be worked, navigated, or placed upon, or moored, in the river within 360 feet of Her Majesty's dockyard or arsenal at Woolwich.

**The Royal Arsenal** adjoins the town of Woolwich on the east. It occupies an area of 274 acres, and comprises within its walls a gun factory, a carriage department, and a laboratory with all the most recent improvements. It contains also vast stores of cannon, shot, and shell for the armament of our forts and ships of war. The

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\* The water in the reach is to be deepened to 16 feet.

works usually employ 4,000 men. The arsenal was first established in 1716. To the eastward, in the Plumstead marshes, is an extensive piece of ground reserved as a practice range.

**BLACKWALL REACH** from the East India docks at Blackwall, curves to the south-west and southward to the town of Greenwich, a distance of about  $1\frac{1}{2}$  miles. The shore on each side continues low. The Isle of Dogs bounds the reach on the west, and Bugsby and Greenwich marshes on the east. Lea ness, or Blackwall point, the north extreme of Bugsby marsh, is low, and bordered by a flat that extends off about half a cable's length. Near the entrance of the West India docks on the east side is the Gun shoal, with 8 and 10 feet on it at low water. Its outer end has been removed; the remainder of the shoal stretches to the northward from the entrance to the South dock, and its extremity is about one-sixth across the river; there is a general depth of 14 feet at low-water springs in the reach.

In front of the East India docks is a wharf called Brunswick wharf, 750 feet in length, with 11 feet water close to it. Here is the terminus of the Blackwall railway, by means of which communication is made with the city and other places. The wharf forms a terrace, commanding extensive views of the river and surrounding scenery.

At East Greenwich, opposite Blackwall pier, is a dry dock, the length of which is 400 feet; width of entrance 60 feet; and average depth of water at spring tides 21 feet; it is called the Blackwall point dry dock.

**Drill ship.**—In the City canal is moored the *President*, drill ship for the Royal Naval Reserve.

**GREENWICH REACH** forms a semicircle, with its extremes to the northward, and is about a mile in extent, and between the walled shores about  $1\frac{3}{4}$  cables across. The north shore is flat, and is formed by the marsh called the Isle of Dogs, having its river frontage covered with steam factories and iron shipbuilding yards, at one of which the *Great Eastern* was built and launched broadside into the river in 1857-8. On the south side of the reach is the town of Greenwich with its hospital, churches, park, and observatory. Charles the Second's palace, now used as a Royal Naval College for the education of officers, consists of four detached piles of buildings forming a square open towards the river. A noble terrace 290 yards long, with a central flight of steps leading

to the water extends in front. The palace was begun in 1675, but it was not until after the naval engagement of La Hogue, 1692, that it was devoted by Queen Mary as a hospital for aged and wounded seamen, and completed by William III. after her death.\*

In the rear of the building is an infirmary and a school for 1,000 boys, the children of seamen.

**The Royal Observatory** stands on the most elevated land in Greenwich park, which rises gradually in the rear of the college to a height of 154 feet above the mean level of the river. It was founded in the reign of Charles II. chiefly for the advancement of navigation and nautical astronomy. Here, passing through the Great Transit instrument, is the primary meridian, from which, in the official publications of Great Britain, America, and several other nations, longitudes are measured East and West.

**Time ball.**—A ball (diameter 5 feet) is dropped every day from the top of a pole on the eastern turret of the Royal Observatory, 211 feet above high water, and 67 feet above ground. The ball is hoisted halfway up at 12h. 55m., as a preparatory signal, close up at 12h. 57m. 30s., and dropped at the moment of 1h. 0m. p.m., Greenwich mean time (drop 10 feet). By observing the instant of the ball leaving the cross-arms, all vessels in the adjacent reaches of the river, as well as in most docks, have an opportunity of finding the error of their chronometers. If from accident the drop of the ball has failed, the ball is gradually lowered and raised again at 1h. 55m. p.m. and close up at 1h. 57m. 30s., and then dropped at 2h. 0m. p.m.

The electric telegraph wire also causes a ball to drop at the same instant at Deal, so that outward bound ships may determine the error and rate of their chronometers.

**Deptford town** is separated from Greenwich by the Ravensbourne, here called Deptford creek. The Dockyard has become the property of the London Corporation, as a foreign cattle market. The adjacent victualling yard, with the old dockyard, has a river frontage of 900 yards, the former having several hydraulic cranes along the wharves, and all the requisites for the rapid supply of a large quantity of provisions. The establishment covers about 41 acres. The depth in the reach abreast the dockyard is from 14 to 20 feet at low water, with an 18 feet rise of tide.

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\* The infirmary of the college has been given for the reception of the sick, hitherto received on board the *Dreadnought*, so long in use as a hospital ship for all nations.

**LIMEHOUSE REACH**, above Deptford, runs to the northward for about three-quarters of a mile, when it trends to the westward round Rotherhithe. Its eastern shore is formed by the Isle of Dogs, where there are yards for building iron ships, manufactories of cement, oil, chain-cables, &c. That part of the reach between the western entrance of the West India and Limehouse docks is called Limehouse hole, and is frequently crowded by foreign vessels. Along this part of the banks of the river are several merchant dockyards, and a steam-boat pier, at which all the Woolwich steam-vessels call ; there is also a pier near the Commercial docks on the western shore. The Regent's canal from Paddington opens into Limehouse dock. It is 9 miles long, and has 12 large locks.

The shore on both sides of the reach continues to be bordered by narrow flats. On the western shore, opposite the West India docks, the flat extends off three-quarters of a cable. The whole breadth of the reach, from the Commercial dock pier across to the Isle of Dogs, is shallow ; the ground being known by the name of the Whiting shoal, which is a compound of conglomerate of shells, lime, and gravel ; over which is a general depth of 9 to 11 feet, but a channel in mid-river of 13 feet deep and 100 feet in breadth has been dredged.

**The Lower Pool**, from the entrance to Regent's canal or Limehouse dock, extends W. by S. nine-tenths of a mile. A little westward of the entrance to Regent's canal are the East India warehouses, and the entrance to the London docks ; and at one-third of a mile farther on is the Thames tunnel, which communicates between Middlesex and Surrey. Its entrance is a little north-east or below Rotherhithe church, and its direction towards King Edward stairs on the Wapping shore. It was completed in 1843, and is now traversed by a railway in connection with the Brighton and South Coast Line. At Wapping new stairs, the first stairs below Wapping ness, is the Thames police office. The steeple of St. Anne, at Limehouse, may be seen throughout the reach, and on the right bank the steeple of St. Mary, with its useful clock, is conspicuous.

A flat borders the right bank of the pool, and a little above the entrance to the canal it extends off about half a cable. On the left bank from the east entrance to the London docks, the flat curves along shore round Wapping ness, and midway its edge is about half a cable from the shore. The colliers here discharge vast quantities of coal, and from this to London Bridge the whole scene on the river is that of activity and bustle.

**The Upper Pool** extends from Wapping ness to London Bridge, a distance of  $1\frac{1}{10}$  miles. On both sides of the pool are a dense mass of buildings and wharves, bordered by coasting vessels moored in tiers under the direction of the harbour masters.

**London Bridge.**—The bridge is a noble structure of five arches, and is 970 feet in length from shore to shore.

A subway for foot passengers runs beneath the Thames between the west end of the Tower and Tooley street; it was opened in 1870.

**DOCKS.**—**Royal Albert Dock**, entered from Gallion reach, is connected with Victoria docks by a cutting. The length of the Albert dock is 2,712 yards with a breadth of 163 yards, and depth in it of 32 feet. The area 87 acres. It is connected to the river in Gallion reach by two locks and a basin. The locks are each 550 feet long and 80 feet broad, the depth on the sill of the southern lock being 30 feet at high water and on the northern lock 36 feet.

**Victoria Docks** occupy a space of 90 acres. The entrance lock, a little below Bow creek, is 350 feet long and 80 wide. The dock has a depth of  $23\frac{1}{2}$  feet of water. There is a half-tide basin of 16 acres, and warehouse floor of about 11 acres. There is also a hydraulic lift dock capable of lifting a ship of 2,000 tons and 300 feet in length on a pontoon for repairs. The docks were opened in 1855.

**The East India Docks** at Blackwall are westward of Bow creek, and include an import basin of 18 acres, an export basin of 8, and an entrance basin of 6 acres. The depth of water in the dock is  $24\frac{1}{2}$  feet. The breadth of the entrance gate is 48 feet. These docks were opened in 1806.

**The West India Docks** extend across the base of the peninsula of the Isle of Dogs; they comprise an import and an export dock, communicating with the river at Blackwall and Limehouse, and a basin of 19 acres for storing timber. The export dock occupies about 24 and the import dock 30 acres. The entrance lock to Blackwall basin is  $191\frac{1}{2}$  feet in length and 45 in breadth, and at spring tides the depth of water is  $23\frac{1}{4}$  feet. The import and export docks are parallel to each other, but divided by stacks of warehouses. The space occupied by the docks and warehouses is 295 acres. These docks were opened in 1802. The City canal is now used as a timber dock. The South, West India dock, parallel to the export dock, is

26 $\frac{3}{4}$  acres in extent, with a lock entrance 300 feet long, 55 feet wide, and with 26 $\frac{1}{2}$  feet over the sill at high water.

**Millwall Docks.**—The entrance to the Millwall docks, which are in the centre of the Isle of Dogs, is on the eastern shore of Limehouse reach. Millwall docks are 35 $\frac{1}{2}$  acres in extent with a depth of 28 feet, and are entered by a lock 450 feet in length, 80 feet in breadth, with 28 feet on the sill at high water ; they are capable of containing the largest vessels, and have graving docks for the repairs of the same. Several windmills formerly stood here, hence its present name—Millwall.

**The Commercial Docks** extend along the shore of Rotherhithe, on the right bank of the river, opposite Limehouse and Millwall. They enclose about 120 acres, of which 70 are water, and were designed to receive vessels laden with timber, corn, &c. They are divided into six unequal parts. Parallel to them is the Grand Surrey canal, having an inner and outer dock at its entrance.

**The London Docks**, situate between Ratcliffe highway and the Thames, consist of two docks covering 40 acres. The deepest entrance is at Shadwell, where there is a lock 350 feet long, 60 feet wide, and with 28 feet over the sill at high water ; besides this there are entrances at Wapping and also at the Hermitage, 2 cables farther up the river. The entire space enclosed is 71 acres. On each side of the Wapping or central entrance is a dolphin, and a transporting buoy lies nearly in the middle of the river, marking the entrance.

**Grand Surrey Canal.**—On the right bank of the pool, about 2 cables southward of the east entrance to the London docks, and about a third of a mile below Rotherhithe church, is the entrance to the Grand Surrey canal. This canal is chiefly used by Canadian timber ships, corn vessels, and light or unemployed shipping. Below the entrance to the canal are various merchant yards and docks.

**St. Katharine Docks.**—About 1 $\frac{3}{4}$  cables beyond the Hermitage entrance to the London docks is that of St. Katharine, close to the westward of which is the Tower of London,\* and beyond it the Custom house. The extent of St. Katharine docks is 10 acres. The entrance lock, near Irongate wharf, is 180 feet long and 45 feet

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\* Small vessels are forbidden to moor within 50 yards, and steamers and large vessels within 90 yards, of the Tower Arsenal wharf, under a penalty.



broad, and admits vessels of 800 tons. The warehouses are large and commodious. This dock was first opened in October 1828.†

**GRAVING DOCKS.**—There are numerous graving docks on both sides of the Thames, capable of receiving merchant ships of the largest size. The largest graving dock is at Tilbury, and is 875 feet long, 70 feet wide and 35 feet on the sill at high water.

**SUPPLIES.**—Supplies of every kind can be procured in abundance in the Thames.

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† For the daily corrections to be applied to determine the depth at high water over the sills of the different entrances, *see* Admiralty Tide tables, page 101.

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## CHAPTER XI.

### THE RIVER MEDWAY—FROM THE NORE TO CHATHAM.

Variation,  $17^{\circ} 0'$  West in 1889.

Decreasing about  $8'$  annually.

The River **MEDWAY**,\* rising near East Grinstead, in Surrey, flows in a winding direction to the north-eastward across the county of Kent, passing Tunbridge, Maidstone, Rochester, and Chatham. The main stream joins the Thames between the isle of Grain on the west, and that of Sheppey on the East; while an arm called the Swale separates Sheppey from the main land. The Medway has three other principal sources and many tributary rivulets. Below Chatham it widens into a broad estuary, where there are several marshy islands. The river is about 60 miles in length, and is navigable for vessels of about 300 tons to Rochester, and for barges to Tunbridge. The tide flows as far as Gibraltar about 4 miles below Maidstone; here is the first lock of the river.

The Medway river from the Great Nore to the first lock, situated between Aylesford bridge and Allington, is a dockyard port, or Queen's harbour, and its regulation is to a great extent under the Queen's harbour master. In 1881, however, a Conservancy act for the river Medway was passed, which delegates certain authority over the river to Commissioners partly elected, and partly appointed by the crown. The river space controlled by the Commissioners is included between a straight line joining Garrison point and Dolly bank in the isle of Grain, to a line across the river at right angles, from a stone at Hawkwood, in the parish of Burham, in the county of Kent, on which stone there is inscribed "God preserve the city of Rochester."

The Commissioners are authorised to make bye-laws, subject to the approval of the Board of Trade and Admiralty, and to appoint a

\* See Admiralty plans of the river Medway, sheets 1 and 2, Nos. 1,833, 1,834, scale,  $m = 6$  inches; charts: North Foreland to the Nore, No. 1,607, scale,  $m = 1\frac{1}{4}$  of an inch; Thames river, Sea reach, No. 1,185, scale,  $m = 2\frac{1}{2}$  inches.

harbour master approved by the Elder Brethren of the Trinity House, London.

The following are the principal regulations for the river :—

1. No rubbish of any description, earth, ashes, dirt, mud, soil, &c., to be thrown into the river under a penalty of £20.
2. No merchant or private vessel is, without permission, to moor or make fast to Government moorings, buoys, piles, or vessels.
3. No merchant or private vessel shall moor, anchor, or be placed in the port within 100 yards from any Government moorings, docks, dockyards, arsenal, wharves, vessels, or hulks ; or within 200 yards from powder magazines, or be moored or placed so as to obstruct navigation.
4. Vessels fouling Government moorings are not to unhook the same but to give notice to the Queen's harbour master or chief authority at the nearest Government dockyard.
5. The portions of the river in which sub-marine mining operations are carried on are marked with *green* and *white horizontally striped conical* buoys. Vessels entering the buoyed-off waters do so at their own risk.
6. Steam dredgers moored in the river exhibit at night three white lights in the form of a triangle.
7. **Steam Whistle Signals.**—The steam-whistle signals are the same as for the Thames, *see* page 360.
8. Ships with a greater quantity than 300 lbs. of any explosive on board are to fly a *red* flag at the mast-head not less than two feet square, whilst in the river Medway.
9. No ships to take on board or discharge explosives excepting at the *red* buoy below Bishop's-ness, or at or to the eastward of the *red* buoy in Saltpan reach near Colemouth creek.
10. Vessels carrying petroleum are to moor at or near the *red* buoy in Gillingham reach, or in Long reach immediately east of the *red* buoy below Bishop's spit, or in Stangate creek, are to lie at the *red* buoy placed in the creek.

Like the Thames the Medway anciently was embanked or "walled" for the preservation of a deep channel, and the safety of the land on either side. This duty of watching over these embankments seems to have been neglected for a considerable period ; lands have been taken in and drained on either side of the river without method, so that mud

accumulates in the estuary, which has been narrowed into a series of shallow tidal channels ; creeks, ditches, and waterways of indescribable kinds intersecting a wilderness of islets. The isolation of the land upon these islands renders it all but valueless ; the difficulty of getting cattle upon such ground is considerable, and a high tide occasionally covers them all, wetting the grass, and flavouring it, and the weeds which thrive there, with salt.

Such is the desolation of these islets that they are mowed by people who come down from the town in boats and openly carry away the produce. It is much to be regretted that a regular system of reclamation is not here instituted, not only for the benefit of the river, but for the benefit of the owners of the land.

In the Medway, as in the Thames, the several bends of the river are termed reaches, of which there are twelve ; they will be described in order.

**SHEERNESS HARBOUR**, at the mouth of the Medway, extends from Garrison point on the isle of Sheppey to Cockle-shell hard, at the south-east side of the isle of Grain, which is marked by a beacon. It lies in a N.E. by E. and S.W. by W. direction, about  $1\frac{1}{4}$  miles in length, and is between Garrison point and high-water mark at the isle of Grain three-quarters of a mile in breadth. On the mud flat on the eastern side of the isle of Grain, at 6 cables north-westward of Garrison point, is a conspicuous Martello tower ; the whole eastern side of Grain island being bordered by an extensive flat, which dries off a considerable distance at low water, and terminates in Grain spit one mile from the shore.

The mud flat ends at Cockle-shell hard, where there are generally a large quantity of cockle shells thrown up on the beach. This part of the isle of Grain from the Martello tower to Cockle-shell hard is called the West Shore ; on it are two black and one white beacon to serve as leading marks. Boats wishing to land on the isle of Grain can only do so about the time of high water, unless at or about Cockle-shell hard.

**Garrison Point** is formed of shingle, and is steep-to ; the water is deep along the wharves of the dockyard, but shoals towards the southern part of it. Between the yard and Queenborough point the mud dries out at low water 3 cables from the shore ; outside this again is a bank called the Lapwell, almost entirely occupied by moorings for gun and mortar boats. On Garrison point is a conspicuous fort.

**LIGHT.**—From the top of the outer or north-western face of the fort on Garrison point a *fixed red* light is exhibited at a height of 50 feet above high water. On entering the river the light is lost sight of on a S.S.E. bearing.

**SHEERNESS**, on the north-west part of the isle of Sheppey, at confluence of the main stream of the Medway with the Thames, consists of four parts, Sheerness proper, Bluetown, Miletown, and Marinetown; the first contains the dockyard, and, with Bluetown, is encircled by fortifications; beyond, are the suburbs called Miletown and Marinetown. Sheerness (Sheerness-on-Sea) has much improved in recent years, and is resorted to as a sea-bathing place to a considerable extent. The material for the manufacture of copperas is found in abundance on the beach eastward of Sheerness.

The town pier, close to the south end of the dockyard, projects out nearly 1,500 feet. Small steam-vessels can lie at the end of it, at all times of the tide, from its extremity, a small *red* light is shown at night. Between the inner part of the pier and the dockyard small merchant vessels unload. The population of the isle of Sheppey in 1871 was 17,000.

**The Dockyard** is built on piles, and the buildings connected with it occupy an area of 57 acres, enclosed by a brick wall. The great basin contains an area of  $3\frac{1}{2}$  acres, with 25 feet 8 inches at high water springs over the sill. There are two other basins of smaller size; three dry docks 230 to 268 feet in length, with 26 ft. 3 in. over the sills at high water springs; two smaller docks; and a building slip. Here is a steam factory and a self-registering tide-gauge. The town is connected by railway with the London, Chatham, and Dover line at Sittingbourne, having a branch to Queenborough point pier.\*

**The CHANNEL** into the Medway is bounded on the south by Jacobs bank and the extensive flats called the Cant, which border the northern shore of Sheppey isle; in some parts the former bank dries off at low water for one-third of a mile from high-water mark. The Cant stretches to the eastward from Garrison point, and at the distance of 3 miles its edge, called the Cheney spit, is about  $1\frac{1}{2}$  miles from the shore, and about three-quarters of a mile southward of the Nore light-vessel. On the north side the channel is bounded by Grain

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\* **NOTE.**—The mean tide level at Sheerness is, from many years' observations, 17 feet 8 inches over the sill of Sheerness Great Basin, or 1 foot 8 inches above Ordnance Datum. The Datum for the reduction of the soundings in the Medway and Thames is 9 feet over the sill of the Basin.

spit, and a shoal called the Middle ground lying eastward of the spit, which narrows the deep water channel to about 3 cables. The Middle ground has only 7 feet on it at low water, and between it and Grain spit there are 12 to 13 feet. The 18 feet tail of the flat eastward of the Middle ground is 3 miles from isle of Grain, and  $1\frac{3}{4}$  miles from the shore of Sheppey. It is marked near its extremity by a *black conical gas buoy*.

**Bar.**—From the tail of the Middle ground a bar of 19 to 21 feet at low water, ordinary springs, extends in a S.E. by E. direction, and joins the edge of the Cant.

The Cheney rocks lie about 4 cables off the fore shore, above  $1\frac{1}{2}$  miles eastward of Garrison point. Their outer edge is marked by a *spar buoy*.

**Beacons.**—On the eastern shore of Grain island are two *black* and one *white* beacon, and on Cockle-shell bank is a *white* beacon surmounted by a triangle. These serve as landing marks between the Middle ground and Cant edge.

**BUOYS.\***—**Sheerness Middle Buoy.**—On the edge of the tail of the flat eastward of the Middle ground, and near its extremity, is a *black conical gas buoy*, with *staff and ball*, in 20 feet, showing an *occulting light*. From it Cockle-shell beacon is open of Garrison point, bearing W. by S.  $\frac{1}{4}$  S., and Minster church S.  $\frac{3}{4}$  W.

**Grain spit** is a *black conical buoy*, in 9 feet, on the extremity of the spit, with Garrison point bearing S.W.  $\frac{1}{4}$  S., distance  $1\frac{3}{10}$  miles, and the Sheerness Middle buoy E. by S.  $\frac{1}{4}$  S.,  $1\frac{6}{10}$  miles.

**Grain edge** is a *conical red buoy* in 6 fathoms; from it Garrison point bears S.S.W. W. 6 cables; and the Martello tower W.  $\frac{3}{4}$  S., nearly three-quarters of a mile.

**Middle Cant** is a *can buoy* painted in *red and white*, vertical stripes, moored in 22 feet on the northern edge of the Cant, with Minster church S. by W.  $\frac{3}{4}$  W.; and Cant edge buoy in line with Martello tower W.  $\frac{1}{4}$  N.

**Cant edge** is a *red and white chequered can buoy* in 23 feet, with black and white beacons on Grain isle nearly in line, W.  $\frac{1}{4}$  S.; Minster church S.  $\frac{1}{2}$  E.

**West Cant** is a *can buoy* painted in *red and white*, vertical stripes, moored in 25 feet, with tower of Victoria Institute in line

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\* Arranged in October 1885, in conformity with the Uniform System of Buoyage, 1883.

with the Range post on Jacob's bank S. by W.  $\frac{1}{2}$  W. ; Cockle-shell hard beacon in line with high-water mark on Garrison point W. by S. S.

**Cheney rocks** is a *spar* buoy, 7 cables S.S.W. from the Cant edge buoy.

**Torpedo ground.**—The ground occupied for torpedo experiments at the Medway river entrance is on a line from Garrison point to a point 20 yards within shore of the Cant edge buoy, and at a distance of 1,000 yards from Garrison point, also on the Grain edge shoal.

Spherical buoys, painted red, mark the positions where the experiments will be made, and mariners are warned to avoid the enclosed spaces.

**TIDES.**—It is high water, full and change, in Sheerness harbour at 0h. 37m. ; springs rise 16 feet, and neaps  $13\frac{1}{2}$  feet. At Chatham at 1h. 11m. ; springs rise 18 feet, and neaps  $14\frac{1}{2}$  feet. The flood stream runs up in mid-channel from 20 to 25 minutes after high water at Sheerness dockyard. The tides are affected by the winds, and with those from the northward there is invariably a greater flow of tide, amounting to 2 and 3 feet above the average. With strong breezes from the S.W. the tide ebbs 2 or more feet below the average. The standard level at Sheerness is 22 ft. below the coping stone of the dockyard wharf, or 9 feet above the sill of the entrance to the Great Basin ; this is 8 inches below the low water of ordinary springs ; and at Chatham 22 feet below the coping stone of the yard at the landing stairs, or 15 feet over the sill of the South lock.

In Sheerness harbour the flood tide sets off from Garrison point towards the middle of the harbour, causing various eddies, and slacks off the dockyard. The ebb runs with great force at springs, and sets at an angle of about  $45^{\circ}$  against the west side of the isle of Sheppey along the dockyard wharves, causing a rebound and much sea. With strong westerly winds it is almost impossible for boats to communicate with the shore during the ebb tide, and it is not uncommon for boats to be carried out of the harbour. Under these circumstances they should endeavour to pull under the lee outside Garrison point.

**DIRECTIONS** from the Nore into Sheerness harbour. When about a third of a mile south-eastward of the Nore light-vessel, bring the white perch with triangle at Cockle-shell hard in line with Garrison point bearing W. by S., and steer in with these

marks, which will lead across the bar. When the southern *black* beacon is in line with the *white* beacon on the isle of Grain, keep it so, and this will lead to the fairway off Garrison point, keeping the *red and white can* buoys on the port side and the *conical* buoys on the starboard side.

The southern tree on Grain islet and northern *black* beacon in line, and also nearly on with the Martello tower, W.  $\frac{1}{4}$  S., leads along the southern edge of the Middle ground. The *white* and southern *black* beacons in line clear the northern edge of the Cant in 19 feet at low water, and lead close to Cant edge buoy.

**CAUTION.**—All merchant vessels seeking shelter should anchor above a line drawn from Cockle-shell hard, to the *black* beacon on Deadman island S.S.W. 9 cables from it. A vessel entering the harbour in a leaky state, or having no anchors, should run on the Lapwell mud bank above Sheerness pier.

It is not advisable for those unacquainted with the river to proceed above Sharp ness without a pilot.

**Anchorage.**—The great Nore is a safe anchorage, but, like all places where the tides are strong, it is subject to a sea in bad weather, particularly with easterly winds, to which it is much exposed. A gale from the north-west also causes much sea, in consequence of the long fetch down Sea reach, but with all other winds this is a convenient anchorage. The best berth for a large vessel is with the Nore light-vessel bearing about N.W. distant half a mile, Garrison point, W.  $\frac{3}{4}$  S., and Minster church S.S.W.  $\frac{3}{4}$  W. in about  $8\frac{1}{2}$  fathoms at low water, soft sandy bottom. The anchorage at the little Nore is with Garrison point bearing S.W. by W.  $\frac{3}{4}$  W., distant a short three-quarters of a mile, and the new church at Miletown in line with the trees on Furze hill, South, in about 8 fathoms. Vessels of war should anchor in Sheerness harbour off the dockyard, in a fairway berth outside the buoys, unless the dockyard authorities direct them to take in moorings. Merchant vessels are not allowed to anchor until above the beacon, near Cockle-shell hard as before stated.

**The Swatchway**, between the Nore sand and Grain spit, is much used by barges and small vessels. The deepest water is close to the westward of the Jenkin buoy, westward of the Nore sand, where there are 8 feet at low water. The *black* buoy on the Grain spit bears from the Jenkin buoy about S.E.  $\frac{3}{4}$  S. distant about 2 miles. Vessels from the Thames shortly after passing the latter buoy will



deepen the water from 8 to 16 feet, and should steer with the Grain spit buoy on the starboard bow in from 10 to 20 and 17 feet, passing it at a distance of a quarter of a mile. The deepest water between the Grain spit and the Middle ground is about 3 to 4 cables eastward of the *black conical* buoy, here there are 13 feet at low water, when the northern *black* beacon is on with the Martello tower, steer for Sheerness harbour.

**SALT PAN REACH** extends W.N.W. and E.S.E., and is about 2 miles in length. It is bounded on the north by the isle of Grain, and on the south by Fleet and Burntwick marshes. From Cockle-shell hard the flat extends a little off, but terminates at about a quarter of a mile to the westward. A small bank of stones with 5 feet water over them lies nearly three-quarters of a cable from the shore at about 7 cables westward of the white perch, the outer edge is marked by a *red* buoy. Above the bank of stones as far as Colemouth creek, a distance of 8 cables, the water is deep, and large vessels may swing close to the shore. From thence bordering the shore of Stoke marsh is an extensive mud bank called Stoke ooze, which is skirted by a flat called Stoke shelf, and on its edge, at  $2\frac{1}{4}$  cables from the shore, are only 12 feet water.

The south side of the reach is bordered by a mud bank, which from Swale ness, the west point of entrance to the Swale, extends off upwards of a quarter of a mile and terminates in Queenborough spit, thence this bank fronts the shore to Stangate creek. About half way between Swale ness and Stangate on the saltings is a *black* beacon, being the southern mark above which all merchant vessels should anchor. From Stangate creek to Sharp ness, the western extreme of the reach, the mud bank is bordered by a shelf which extends along shore, and at a third of a mile from the ness stretches off to a distance of a quarter of a mile, with 16 feet water on its edge. This projection is called Sharp ness shelf, it is marked on its outer end by a buoy.

**SHARP NESS SHELF** is a *can* buoy *chequered red and white*, in 22 feet with Dockyard sheers in line with beacon on Cockle-shell hard East ; coast guard flag at Colemouth creek, N.N.E.  $\frac{3}{4}$  E.

**Port Victoria.**—Victoria pier, the terminus of the South-eastern railway, is situated about 2 cables east of the Stone bank and 5 cables west of Cockle-shell hard. Its length is 500 feet and its breadth 42 feet ; at the outside of the pier the depth of water is 19 feet at the

west end, 24 feet at the middle, and 23 feet at the east end. Its inner side is quite dry at low water.

**Measured half mile Marks.**—On the south side of Grain isle, on the northern shore of Salt Pan reach, beacons have been erected marking two half miles, or a total of one mile. The inner beacons have all of them diamond tops, the outer west beacon has a cage, the outer centre beacon a ball, and the outer east beacon a cage.

**Stoke shoal**, with only 13 feet over it at low water, and about a cable in extent, lies right in the fairway of the river, about a quarter of a mile north-west of the edge of Sharp ness shelf. To clear the Sharp ness shelf, keep Dockyard sheers, or Cockle-shell hard beacon, on with the outer middle half-mile beacon East, until Oakham ness is well open of Sharp ness W.S.W., then steer for Oakham ness to avoid Stoke shoal. The water is deep at and above Sharp ness.

**Anchorage.**—There is good anchorage in any part of Salt Pan reach for vessels of the largest size, eastward of Colemouth creek, but it is not advisable to anchor off the creek, as here the navigable channel is narrow, and if necessary to get underway with the first of the flood there is not so much room as lower down.

**Explosives.**—A *red conical* buoy is placed on the south edge of Stoke shelf to mark the anchorage for vessels loading and unloading explosives. The anchorage is to the eastward of the buoy. *This is not a navigational buoy.*

**The Swale** a small branch of the Medway, separating the isle of Sheppey from the main, is navigable for small vessels and barges. At Kings ferry, 3 miles from Sheerness, it is crossed by the Sittingbourne and Sheerness railway bridge, the middle of which is fitted with an opening span to enable vessels to pass. The least depth up to the bridge is 8 feet at low water, and at Long point, a little above the town of Queenborough on the isle of Sheppey, the depth is 50 feet.

**Queenborough point**, the East point of the entrance to the Swale, opposite Swale ness, is the place of departure and arrival of the Zeeland Company's steam vessels, which carry mails and passengers to and from Flushing, in connexion with the London, Chatham, and Dover railway, the terminus of which is on the pier at Queenborough point. A commodious T-headed pier 600 feet in length has been built for their accommodation, and the railway runs on to the pier. \*

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\* Vessels of 12 feet draught can lie alongside at low water.

**LIGHTS.**—On Queenborough spit is a pile lighthouse in 6 feet water, from which is exhibited a *fixed* white light at an elevation of 30 feet above high water. The light can be seen from a distance of 5 miles.

From Queenborough pier two *red* lights 300 feet apart are exhibited as a leading mark between Queenborough spit and Lapwell bank. The low light is at the north extremity of the pier. The lights are visible through an arc of 45 degrees, and in clear weather can be seen from a distance of 3 miles. When in line they bear S. 16° W. and are elevated 20 and 50 feet respectively above high water.

**Buoy.**—A buoy on which is a notice board has been placed on Lapwell bank, at the entrance to Swale channel, to assist the navigation, and to prevent vessels from anchoring in the fairway of that channel.

The buoy is moored in 14 feet low water spring tides, with Queenborough spit beacon bearing S.W.  $\frac{1}{2}$  W. distant 280 yards; with the following notice painted on it in black letters on a white surface, viz.:—*All vessels to anchor eastward of this buoy.*

**STANGATE CREEK (Quarantine Ground)**, a small arm of the Medway bounded on either side by low marsh land, is the well known quarantine station. It runs to the southward for more than  $1\frac{1}{2}$  miles, carrying from 40 to 9 feet at low water, when it branches off in different directions. About half a mile within the entrance on the west side is a creek leading to some oyster grounds and through to Ham creek, having depths of from 5 to 44 feet. At the *red* buoy at the entrance to this creek is one of the places appropriated by the Medway Conservancy Board for the discharge or loading of petroleum.

**Buoy.**—On the end of the spit at the west side of the entrance to Stangate creek is a *red* can buoy in 22 feet at low water.

There is only one set of moorings in the creek, marked by a trunk buoy, the cables of which are across the creek. This secure anchorage is available for vessels frequenting the locality.

**TIDES.**—The flood tide sets from Sheerness harbour towards the mooring buoys at Blackstakes, and from thence straight up Saltpan reach. Close inshore there is an indraught into Stangate creek. The ebb tide sets from Kethole reach towards the isle of Grain and along the line of mooring buoys on that shore, causing a slack on the

south shore above Stangate creek. There is also a slack tide on the flood inshore by the isle of Grain.

**KETHOLE REACH**, extending to the south-westward from Saltpan reach, is about a mile in length and bounded on the north-west by the Stoke and Oakham marshes, and on the south-east by Burntwick marsh. At the south end of the reach is Half Acre creek, from which branch off the Yantlet, Lower Rainham, and Otterham creeks. Sharp ness is the north-east extreme of the reach, and Oakham ness and the spit of Bishops ooze the southern extremes. On the north-west shore the extensive mud flat called Stoke ooze continues to Oakham ness, with two openings, named Stoke and East Hoo creeks.

Off Oakham ness, the north point of entrance to Long reach, is a *red conical* buoy. On the east shore is a beacon which marks the entrance to Captains creek, leading into Sharfleet oyster grounds, which is much used by the fishermen during the oyster season ; there is also another beacon south of the last, called Dray beacon, on the edge of the marsh at the south entrance of Ham creek. The line of tide is always so plainly defined that it is only necessary for vessels to keep in the stream of it, and when working, tack before getting into the eddy. In standing towards Stoke and Hoo creeks, tack when in 6 fathoms water. The lead should be attended to.

**Anchorage.**—It is customary for vessels of large draught to anchor in Kethole reach to wait for the tide. If bound up, anchor on the western shore ; but if going down, on the eastern shore. In both cases the tide sets off : vessels will thus be out of the track of those under way.

**LONG REACH** extends nearly W.N.W. and E.S.E. about  $1\frac{3}{4}$  miles. It is bounded on the north, between Oakham ness and West Hoo creek, by the Slede ooze ; and on the south by Bishops marsh, which is bordered on the north side by a mud bank, and an extensive mud flat running eastward from it named Bishops ooze.

On the north side of the channel is an extensive shoal called the Mussel bank, a part of which to the south-eastward of Tea-pot hall, on the north shore, nearly dries at low springs. The navigable channel is thus reduced at low water to less than a cable in breadth, having a depth of 15 feet ; but on the south side of the reach along by Bishops marsh is a narrow lane of deep water carrying at least

20 feet, leading into Pinup or Folly reach. The south edge of the Mussel bank is marked by two *red conical* buoys.

**Anchorage.**—In the lower part of this reach, off Bishops ness, is a good berth.

**Explosives.**—A *red can* buoy is placed on the north edge of Bishops bank to mark the anchorage for vessels loading and unloading explosives. Vessels must moor to the eastward of the buoy.

**DIRECTIONS.**—From Kethole reach steer westward towards Gillingham church (which is conspicuous, and stands on rising ground surrounded by trees), and when Frindsbury mill (a little north of Strood) is nearly on with the north side of Bishops marsh steer about W.N.W. The leading mark through the reach is Frindsbury mill on with the south end of the houses at Upnor. Frindsbury mill on with the north end of Folly marsh, forming the south side of West Hoo creek clears the Mussel bank. A small red-roofed house in the sheepfold on Folly marshes, in line with the tall elm trees close to the southward of Frindsbury church, lead to the southward of it.

**PINUP or Folly Reach** extends a distance of half a mile to the south-westward from Darnett ness, the north-west part of Bishops marsh ; the south-west end being Folly point, off which, a little within the low water, is a beacon marking some stones. On the eastern shore is Bishops marsh, and on the west Hoo flat or Folly marshes, bordered by an extensive mud flat.

A large circular fort, call Darnett, has been erected on the ness of that name and a similar one on Folly point, called Hoo fort.

**Pinup bank**, in the upper part of Pinup reach is a dangerous shoal, with only 7 feet on it at low water, which here contracts the channel to a width of 240 feet. The south end lies with the flagstaff at the West Entrance to the Basins of Chatham dockyard on with Hoo point or ness. Two *red conical* buoys mark its south and eastern edges. The deep water channel is to the southward of this bank ; but there is a very good channel, carrying 8 feet at low water northward of it.

**DIRECTIONS.**—Vessels after rounding Darnett ness should steer about S.W.  $\frac{3}{4}$  S. for Friday mill or a little eastward of it. When Tea-pot hall is a little open of Darnett ness N.E. steer on that line until the flagstaff at the West Basin entrance at Chatham extension works opens of Hoo ness, then steer to the north-westward and

bring the chimney at the East Basin entrance of Chatham dockyard just open north of the flagstaff in front of it which leads through Gillingham reach to abreast Hoo ness.

**Tides.**—The flood tide sets off Darnett ness towards Folly point causing a slack tide to the south of the ness. The ebb sets from Gillingham reach into Yantlet creek.

**Submarine mine space.**—Buoys have been placed to mark the spaces appropriated for submarine mining operations in Long, Pinup, and Gillingham reaches.

These buoys are painted *white* and *green* in horizontal bands, and marked *Submarine mine field* in red letters.

The mined space in Long and Pinup reaches, is marked by four buoys, placed about  $1\frac{1}{2}$  cables apart in an E.N.E. and W.S.W. direction, or nearly parallel with the low-water line on the northern bank of the river; this space is included between a line drawn from Folly point beacon to the westernmost buoy—this buoy bears E.N.E. from the beacon distant 3 cables—thence to the several buoys in succession, and finally to a line drawn from the easternmost buoy northward to the shore.

The ship channel in Long and Pinup reaches is south-eastward of these buoys.

The mined space in Gillingham reach is marked by two buoys, placed about three-quarters of a cable apart in an E.S.E. and W.N.W. direction, the westernmost buoy being moored with Gillingham wharf bearing W.N.W., distant about 3 cables; this space is contained by a line joining these buoys, and lines drawn from them in a southerly direction to the shore.

The ship channel in Gillingham reach is northward of these buoys.

A space extending 3 cables north-eastward of Folly point, and within half a cable of the shore at high-water ordinary spring tides, is appropriated for laying out booms and other obstructions for purposes of instruction; this space, which is inshore of the general navigation of the river, should be avoided.

**Anchorage for vessels with explosives.**—A *can* buoy painted *red*, to the eastward of which vessels are to moor, is placed opposite Folly point, in 19 feet at low-water spring tides, with the following bearing, viz.:—Hoo church, N. by W.; Gillingham church, W. by S.  $\frac{1}{4}$  S.

**South Yantlet Creek** is an arm of the river running somewhat

parallel to Long reach and southward of it. It is formed by the isle called Bishops marsh and the extensive mud flat named Bishops ooze extending eastward of it. This creek runs from Pinup reach to that of Kethole, but is nearly dry in places at low water.

**GILLINGHAM REACH** extends from Folly point in a W.N.W. direction, and is about a mile in length. The north shore is bordered by a mud bank which extends off about three-quarters of a cable. Along the south shore the mud dries off some distance, and on it are several small islets. A shoal called the Mussel, stretching from the south shore, contracts the channel to half a cable in breadth. A vessel after rounding Pinup bank should, as before mentioned, keep the chimney at the east entrance of Chatham dockyard basins just open north of the Flagstaff in front of it which leads north of the Mussel bank to Hoo ness.

Nearly in mid-channel south-westward of Hoo ness is a shoal about a quarter of a cable in length, having 11 feet over it at low water. Either side of it there is 14 feet water. There is a good space for anchoring between the lower moorings off Gillingham and Hoo ness in 17 feet water ; or westward of Hoo ness with Folly point open, in 25 feet. Off Folly point beacon, westward of the Pinup bank, the depths are 24 to 28 feet.\*

**TIDES.**—The flood tide sets from Folly point towards the south shore above Muddle creek, and then branches off. The ebb sets from Short reach towards the moorings and Commodore's hard, then down the reach into South Yantlet creek and Pinup reach.

**SHORT or SOVEREIGN REACH**, between Hoo ness and Chatham dockyard, is about half a mile in length. It is bordered by a shelving sandy flat on each side, leaving in mid-channel a narrow passage having from 12 to 17 feet at low water. A vessel having rounded Hoo ness and arrived at about a third of a mile above the eastern entrance to the Fitting out basin, should keep Muddle creek *white* beacon a little open of Hoo ness which will lead between the dockyard embankment and the north part of Hoo flats, in not less than  $11\frac{1}{2}$  feet at low water.

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\* Since the closing of St. Mary creek, the action of the tide is washing away the bank at Hoo ness (Cat ness).—Staff Captain, J. Loane, Master Attendant, H.M. Dockyard, Chatham, 1876.

**COCKHAM WOOD REACH** is that part of the Medway between the north-eastern embankment of Chatham dockyard and the London stone at Lower Upnor. It runs in a N.W. by W. direction, and is about three-quarters of a mile in length. On the north shore are the ruins of an old fort at Cockham wood. The Dockyard foreshore, the river front of which is faced with stone, is bordered by a shelf which extends a little off, having 8 to 12 feet water on it. At the north extreme of the marsh and opposite the Crow or London stone, the edge of the shelf is about half a cable from the shore. In mid-channel is a small bank with only 11 feet water on it.

**Powder ship.**—The *Leonidas* is moored on the south side of Cockham wood reach.

**UPNOR REACH** extends from the London stone at Lower Upnor in about a S.W. by S. direction, and is about three-quarters of a mile in length. Upnor castle stands on the western shore, and a little below it is the powder magazine, off which vessels are not allowed to anchor. The depths in this reach are from 10 to 18 feet at low water.

**CHATHAM REACH**, a continuation of Upnor reach, extends in a S.W. by S. direction to the old town of Chatham. On the western shore is Tower hill, and southward of it low marsh land, with Whitewall creek between; on the eastern shore is the Royal dockyard, Ordnance department, and the Marine barracks. From both sides of the channel banks extend off abreast the lower building shed narrowing the channel (in which there is only 13 feet at low water) to 150 feet.

Between these banks and lower part of the yard the depths are from 12 to 17 feet; and between the ordnance wharf and the opposite shore from 13 to 20 feet will be found, the deepest water being along by the wharf. In the bend of the river there are from 8 to 19 feet at low water, the deepest water being rather south of mid-channel.

**CHATHAM.**—The town stands on the right bank at the bend of the river above the dockyard. It includes that of Brompton, and adjoins Rochester so closely, by a long, narrow, irregular street, as to form rather one town than an independent city. In the town near the dockyard there are Marine barracks, and a Naval hospital with 260 beds. The population of Chatham in 1881 was 46,806; and that of Rochester was 21,807.



**The Dockyard**, including the extension works, contains an area of 500 acres, and presents a line of 4,800 yards of river wall and stone faced embankment; here are seven building slips, and eight docks. The largest of the docks is 416 feet in length on the blocks, and has 32 feet over the sill at high-water springs. Three large basins connected with each other form a continuous water way from Chatham reach to Gillingham reach, the western entrance in Chatham reach is shut by a caisson and has 12 feet over the sill at low water springs; the Eastern or Gillingham reach Entrance consists of two locks 477 feet in length with 15 feet over the sill of the southern and  $16\frac{1}{2}$  over the northern at low water ordinary springs. The western or repairing basin, out of which are four graving docks, has an area of 21 acres, the centre or factory basin 20, and the eastern, for fitting out, 28 acres. It is also proposed to deepen the river to 19 feet at low water, or 35 at high water, for a channel 200 yards wide.

**LIMEHOUSE REACH**, in a north and south direction, is about three-quarters of a mile in length, and extends from the bend of the river to the Rochester gas works on the point opposite the chalk cliffs.

On the west side over the marshes is the city of Rochester with its ancient castle and cathedral. The depths in the reach vary from 12 to 20 feet at low water. Moorings are laid down for the convenience of merchant vessels. There are two small knolls in mid-channel between the buoys, with 11 and 12 feet over them, but water is the deeper on either side.

**BRIDGE REACH** extends from the gas works to Rochester bridges, a distance of about one-third of a mile. The depths in this reach are very irregular, varying from 5 to 20 feet, the latter depth being close up to the bridge, a little below which is a shoal running across the reach with one to 6 feet over it. The general depths may be said to be 8 or 9 feet.

Off the water-mill at Strood there is a hole having 17 and 18 feet water in it; and in the bend of the reach, between the gas works and the entrance to the old Gravesend and Rochester canal there are 14 to 20 feet. At the north side of the reach are the stations of the North Kent, Maidstone, Chatham, and Dover railways. Steam-boats run between this and Chatham, Sheerness, &c., several times a day in the summer.

Near the South-Eastern railway terminus, and connected with it, is a basin adapted for vessels of moderate draught ; it is 200 feet in length, with an average breadth of 114 feet and depth of 18 feet. It is entered by a lock 120 feet long by 30 feet wide, and a depth over the sill of 16 to 18 feet at springs, and 12 at neaps.

There are several extensive manufactories of Portland cement around the district of Strood.

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TABLE

SHOWING the Time of High Water on Full and Change Days, with the Rise of Tide at Springs and Neaps above the Low Water Level of Ordinary Springs, and the Range\* at Neaps, at different places on the East Coast of England.

Place.	High Water, Full and Change.	Rise.		Range at Neaps.	Place.	High Water, Full and Change.	Rise.		Range at Neaps.
		Springs.	Neaps.				Springs.	Neaps.	
Berwick	h. m.	Ft.	Ft.	Ft.	Yarmouth Road	9 15	6	4 $\frac{1}{2}$	3
Holy Island Harbour	2 18	15	11 $\frac{1}{2}$	8	—, Haven, Brush	9 15	5 $\frac{1}{2}$	4 $\frac{1}{2}$	2 $\frac{3}{4}$
North Sunderland	2 30	15	11 $\frac{1}{2}$	8	—, Bridge	—	5	4	3
Coquet Road	3 0	14 $\frac{1}{2}$	11	7 $\frac{1}{2}$	Lowestoft	9 57	6 $\frac{1}{2}$	5 $\frac{1}{2}$	4
Blyth	3 15	15	11	7	Blyth River, South-	—	—	—	—
Tyne River Entrance	3 20	14 $\frac{1}{2}$	11 $\frac{1}{2}$	7 $\frac{1}{2}$	wold	10 20	6 $\frac{1}{2}$	4 $\frac{1}{2}$	2 $\frac{1}{2}$
—, North Shields	3 21	14 $\frac{1}{2}$	11 $\frac{1}{2}$	7 $\frac{1}{2}$	Aldeburgh	10 45	8	6 $\frac{1}{2}$	—
—, Howdon	3 23	15	11 $\frac{1}{2}$	7 $\frac{1}{2}$	Kentish Knock	11 47	—	—	—
—, Walker	3 26	15 $\frac{1}{2}$	11 $\frac{1}{2}$	7 $\frac{1}{2}$	Orfordness	11 15	8	6 $\frac{1}{2}$	5
—, Newcastle	3 32	15 $\frac{1}{2}$	11 $\frac{1}{2}$	8	Orford Haven Bar	11 30	7 $\frac{1}{2}$	—	—
Sunderland	3 22	14 $\frac{1}{2}$	11	7 $\frac{1}{2}$	—, Quay	0 30	7 $\frac{1}{2}$	—	—
Seaham	3 24	14 $\frac{1}{2}$	10 $\frac{1}{2}$	6 $\frac{1}{2}$	—, Slaughden	1 00	7 $\frac{1}{2}$	—	—
Hartlepool	3 28	15	11 $\frac{1}{2}$	8 $\frac{1}{2}$	—, Snape Bridge	3 00	6	—	—
Tees River Bar	3 45	15	12 $\frac{1}{2}$	9 $\frac{1}{2}$	Woodbridge Haven	—	—	—	—
—, Middlesborough	3 55	13	10 $\frac{1}{2}$	7 $\frac{1}{2}$	Bar	11 45	12	9	6
—, Stockton	4 25	11 $\frac{1}{2}$	8 $\frac{1}{2}$	5 $\frac{1}{2}$	—, Kingston Quay	0 35	10	—	—
Whitby	3 45	15	11 $\frac{1}{2}$	8	—, Wilford Bridge	0 55	7	—	—
Scarborough	4 11	15 $\frac{1}{2}$	12 $\frac{1}{2}$	9 $\frac{1}{2}$	Harwich Harbour	0 6	11 $\frac{1}{2}$	9 $\frac{1}{2}$	8
Filey Bay	4 20	16	12 $\frac{1}{2}$	9	Orwell River, Pinmill	0 20	12	—	—
Bridlington	4 39	16	12	8	—, Downham Reach	0 27	12	—	—
Humber River, Spurn	—	—	—	—	—, Ipswich	0 35	13 $\frac{1}{2}$	—	—
Point:	5 26	18 $\frac{1}{2}$	15	11 $\frac{1}{2}$	Stour River, Wraabness	0 29	12	—	—
—, Grimsby	5 36	19 $\frac{1}{2}$	15 $\frac{1}{2}$	11 $\frac{1}{2}$	—, Mistley Quay	0 48	11 $\frac{1}{2}$	—	—
—, Killingholme	6 2	19 $\frac{1}{2}$	15 $\frac{1}{2}$	11 $\frac{1}{2}$	—, Cattawade Bridge	1 8	4 $\frac{1}{2}$	—	—
—, Hull	6 29	20 $\frac{1}{2}$	16 $\frac{1}{2}$	11 $\frac{1}{2}$	The Naze	0 6	12 $\frac{1}{2}$	10	7 $\frac{1}{2}$
—, Ouse River,	—	—	—	—	Colne River, Colne	—	—	—	—
Goole	7 26	13 $\frac{1}{2}$	—	9	Point	12 00	14	10	6
Boston Deep, Clay	—	—	—	—	—, Wivenhoe	0 10	15	10	5
Hole	7 0	23 $\frac{1}{2}$	—	9 $\frac{1}{2}$	Blackwater River,	—	—	—	—
—, Boston Sluice	—	23 $\frac{1}{2}$	—	—	Sales Point	12 00	14 $\frac{1}{2}$	10	5 $\frac{1}{2}$
Lynn Deep, Long Sand	6 0	23	16 $\frac{1}{2}$	—	—, Heybridge	0 20	12	8	4
—, Lynn Road	—	23 $\frac{1}{2}$	—	—	Chelmer River,	—	—	—	—
—, Lynn	—	22 $\frac{1}{2}$	—	—	Maldon	0 32	10	6	2
Sutton Bridge	—	20 $\frac{1}{2}$	—	—	Gunfleet Sand, N.E.	—	—	—	—
Wisbech	7 30	15 $\frac{1}{2}$	—	—	end	11 40	12	8	4
Wells	7 0	12	—	—	Crouch River,	—	—	—	—
Wells Bar	6 20	18	—	—	Foulness	0 5	14 $\frac{1}{2}$	10 $\frac{1}{2}$	6 $\frac{1}{2}$
Cley	—	5 $\frac{1}{2}$	—	—	—, Hull Bridge	0 25	16	11	6
Blakeney	6 30	15	—	—	Maplin Light	0 5	14 $\frac{1}{2}$	10 $\frac{1}{2}$	6 $\frac{1}{2}$
Blakeney Bar	6 30	15	—	—	Nore	0 30	15 $\frac{1}{2}$	13	10 $\frac{1}{2}$
Cromer	7 0	14 $\frac{1}{2}$	11	7 $\frac{1}{2}$	Margate	11 45	15 $\frac{1}{2}$	13	10 $\frac{1}{2}$
Outer Dowsing Light	—	—	—	—	Pansand Hole	12 0	15 $\frac{1}{2}$	13	10 $\frac{1}{2}$
Vessel	6 10	15	—	—	Gravesend	1 5	18 $\frac{1}{2}$	15	11 $\frac{1}{2}$
Dudgeon Light Vessel	6 20	15	—	—	Woolwich	1 37	18 $\frac{1}{2}$	15 $\frac{1}{2}$	12 $\frac{1}{2}$
Happisburgh	7 40	11	—	—	Greenwich	1 43	19	15	11
Winterton ness	8 25	7 $\frac{1}{2}$	—	—	London Docks	1 53	20 $\frac{1}{2}$	17 $\frac{1}{2}$	13 $\frac{1}{2}$
Leman and Ower	—	—	—	—	London Bridge	1 58	20 $\frac{1}{2}$	17 $\frac{1}{2}$	13 $\frac{1}{2}$
Light Vessel	7 15	9	—	—	Sheerness	0 37	16	13 $\frac{1}{2}$	10 $\frac{1}{2}$
Hammond Knoll	7 40	10	—	—	Chatham	1 11	18	14 $\frac{1}{2}$	11
Winterton Ridge	8 0	10	—	—					

\* The range is considered to be the rise of any tide from its low water level to its high water level.

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DARTMOUTH	-	-	R. Cranford	-	-	Library.
DOVER	-	-	C. Clout	-	-	135, Snargate Street.
DUNDEE	-	-	P. A. Feathers	-	-	40, Dock Street.
DUBLIN	-	-	Hodges, Figgis, & Co.	-	-	104, Grafton Street.
"	-	-	F. M. Moore	-	-	23, Eden Quay.
FALMOUTH	-	-	A. B. Duckham	-	-	Lloyd's Agent.
GLASGOW	-	-	D. McGregor & Co.	-	-	37, 38, Clyde Place.
"	-	-	Jas. Whyte & Co.	-	-	144, Broomielaw.
"	-	-	A. Dobbie & Son	-	-	24, Clyde Place.
GREENOCK	-	-	D. McGregor & Co.	-	-	36, Brymnner Street.
"	-	-	R. Love	-	-	Havelock Buildings.
GRIMSBY	-	-	O. T. Olsen	-	-	Fish Dock Road.
HULL	-	-	R. C. Appleby	-	-	Custom House.
HARTLEPOOL	-	-	G. Pearson	-	-	21, High Street.
LEITH	-	-	D. Stalker	-	-	6, 8, Commercial Street.
LIVERPOOL	-	-	D. McGregor & Co.	-	-	72, South Castle Street.
"	-	-	Frodsham & Keen	-	-	9, St. George Crescent.
"	-	-	Graham & Parks	-	-	43, Canning Place.
"	-	-	Philip Son & Nephew	-	-	South Castle Street.
LONDON	-	-	J. Imray & Son	-	-	89, 102, Minories.
"	-	-	E. Stanford	-	-	55, Charing Cross.
LONDONDERRY	-	-	Minniece	-	-	10, Ship Quay Street.
MARYPORT	-	-	Quintin Moore	-	-	Harbour House.
MIDDLESBOROUGH	-	-	Warley, Pickering, & Co.	-	-	Docks.
NEWCASTLE - ON	-	-	M. S. Dodds	-	-	61, Quayside.
TYNE.	-	-		-	-	
"	-	-	S. A. Cail & Sons	-	-	29, 31, Quayside.
NORTH SHIELDS	-	-	Wilson & Gillie	-	-	New Quay.
NEWPORT, MON.	-	-	C. & E. Williams	-	-	56, Dock Street.
OBAN	-	-	J. P. Miller	-	-	Times' Office.
PLYMOUTH	-	-	R. W. Stevens	-	-	15, Parade.
"	-	-	T. W. Hoppins	-	-	42, Southside Street.
"	-	-	G. E. Hicks	-	-	17, Southside Street.
PORTSEA	-	-	Griffin & Co.	-	-	2, The Hard.
QUEENSTOWN	-	-	T. Miller	-	-	1, Harbour Row.
SOUTHAMPTON	-	-	S. W. Wolff	-	-	76, High Street.
"	-	-	J. B. Thomas	-	-	9, Canute Road.
SUNDERLAND	-	-	T. Reed & Co.	-	-	184, High Street West.
"	-	-	J. J. Stiles	-	-	196, High Street East.
SOUTH SHIELDS	-	-	T. L. Ainsley	-	-	Mill Dam
SWANSEA	-	-	F. Martin	-	-	Somerset Place.

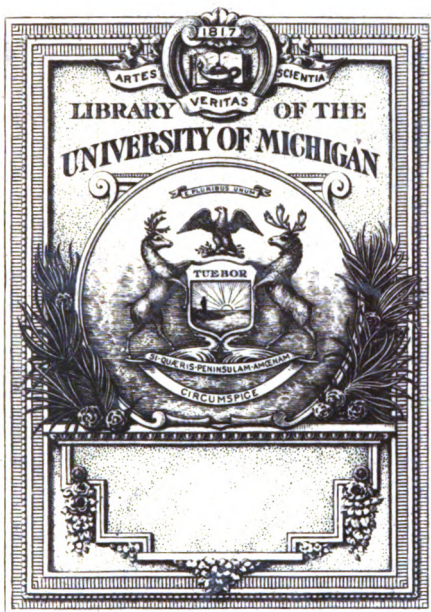
## ADMIRALTY AGENTS FOR THE SALE OF CHARTS ABROAD.

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BERLIN	-	D. Reimer	-	-	12, Anhalt Strasse.
BOMBAY	-	A. C. Lloyd	-	-	Apollo Street.
BREMERHAVEN	-	W. Ludolph	-	-	Nautisches Institut.
BRISBANE	-	-	-	-	Port Office.
CANADA	-	Charles Potter	-	-	King Street.
CAPE TOWN	-	Juta & Co.	-	-	Booksellers.
CONSTANTINOPLE	-	Giorgio Carneri	-	-	70, Rue Geumruck.
GIBRALTAR	-	Rumbo & Molinary	-	-	Mercantile Marine Service Association.
HAGUE, THE	-	Van Cleef Brothers	-	-	Libraries.
HAMBURG	-	Eckhardt & Messtorff	-	-	Steinhof 1.
"	-	Thos. Downie	-	-	9, Stubbenhuk.
"	-	Friederichsen & Co.	-	-	61, Neuer Wall.
HAVRE	-	V. & M. Lepetit	-	-	13, 15, Rue de Paris.
HOBART	-	Walch & Sons	-	-	Merchants.
HONG KONG	-	C. J. Gaupp & Co.	-	-	Booksellers.
HONOLULU	-	Lieut. Jackson, R.N.	-	-	
MALTA	-	Com. Laprimandaye, R.N.	-	-	Port Office.
MARSEILLES	-	A. Rabier	-	-	4, Quai Rive Neuve.
MELBOURNE	-	J. Donne & Son	-	-	59, Elizabeth Street.
MONTREAL	-	Dawson Bros.	-	-	Booksellers.
"	-	Hearn & Harrison	-	-	1640—1642, Notre Dame Street.
NEWCASTLE	-	R. C. Knaggs & Co.	-	-	Hunter Street.
NEW YORK	-	Eggerts & Sons	-	-	74, Wall Street.
"	-	Bliss & Co.	-	-	128, Front Street.
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"	-	Challamel & Co.	-	-	5, Rue Jacob.
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SHANGHAI	-	Lane, Crawford, & Co.	-	-	Merchants.
"	-	Morrison & Co.	-	-	Do.
SINGAPORE	-	Crawford	-	-	Sailor's Home.
SYDNEY	-	Bullard & Co.	-	-	George Street.
SUEZ	-	Capt. Weston	-	-	Port Office.
VALPARAISO	-	Shringley and Westcott	-	-	Calle Cabo.
VANCOUVER ISLAND	-	Hibben & Co.	-	-	Victoria.
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